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BALING COTTON AT GINS

Practices and Costs

- *Flat*
- *Standard*
- *High Density Bales*

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U.S. DEPARTMENT OF AGRICULTURE
BELTSVILLE BRANCH

by J. D. Campbell and R. C. Soxman

Farmer Cooperative Service
in cooperation with
Agricultural Marketing Service
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Preface

This study is a joint contribution of the Marketing Division, Farmer Cooperative Service, and the Marketing Economic Research Division, Agricultural Marketing Service. It was conducted under authority of the Agricultural Marketing Act of 1946 (RMA, Title II).

Appreciation is hereby expressed for the assistance of cooperative and other ginners, public cotton warehousemen, cotton shippers, cotton spinners, gin machinery manufacturers, and electric power companies. Special credit is due to Otis T. Weaver for assistance in analyzing the data. Participation by Arthur L. Roberts and James S. St. Clair in the collection and assembly of data also is gratefully acknowledged.

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Summary

Findings of this study indicate that a sizable expansion in the use of gin standard density presses seems economically feasible in the western cotton growing region and in parts of Texas. Such presses, however, are not likely to be widely adopted in most older areas of the Cotton Belt.

Under existing regulations and trading rules, gin high density presses apparently face a limited future. These presses, however, do turn out a neat and almost fully covered bale which probably would ultimately overcome dissatisfaction with the American cotton bale package in foreign markets.

During 1956-57, 17 gins in Arizona and California with standard density presses and 18 gins with flat bale presses were selected for study as to relative costs, problems, and practices, by type of bale. Information also was obtained on marketing aspects from cotton shippers, compresses, and spinners. In 1957-58, a study was made of the three gins in California then operating high density presses.

About 98 percent of the gins in the United States currently package cotton as bulky flat bales with a density of about 13 pounds per cubic foot. Such bales before undergoing long haul domestic transportation are moved to a compress where they are repressed to standard density (22 pounds per cubic foot) or to high density (32 pounds a cubic foot), if exported.

The remaining approximately 2 percent of gins operate new type presses turning out bales that are as dense or denser than standard density bales compressed at warehouses. This small group of gins, located almost entirely in the West and chiefly installed in the past decade, now handle about 5 percent of the entire crop. The great majority of these new type presses turn out standard density bales with an average density of about 24 pounds per cubic foot. A few gin presses of recent origin are designed to produce high density bales with a density of 32 pounds per cubic foot.

Gins participating in the study had annual volumes averaging about 7,000 bales per gin with no significant differences by type of bale press. Flat bale presses were operated almost exclusively by 2-man crews as compared with an average of 2.7 men on standard density presses and 3 men on high density presses.

Presses were powered by pump motors averaging approximately 15, 60, and 134, horsepower per press at flat, standard, and high density gins, respectively. The time required in pressing and tieing out a bale, averaged about 39 and 38 seconds longer at standard and high density presses, respectively, than at flat bale presses. This added time apparently did not cause a slowdown in rate of gin operation.

Data collected from participating gins on installed costs and operating expenses were found to vary appreciably, even among presses of the same type, because of differences in age, design, and management factors. For these reasons, a model approach was used in cost analyses based on computing costs of installing new presses at a California location for operation in the 1958-59 season. On this basis, installed costs were computed to be about $22,000 for a flat bale press, approximately $49,000 for a standard density press, and almost $68,000 for a high density press.

At an annual volume of 4,000 bales, costs for operating standard and high density presses exceeded that for a flat press by $1.31 and $1.94 a bale, respectively. At the volume level of 7,000 bales, the cost per bale for press operation at the high density press was 39 cents higher than at the standard density press, and $1.35 above that at the flat press.

Power was a very minor cost item ranging from 1 to 6 cents a bale. Labor was by far the largest single item of expense, accounting for approximately 50 to 70 percent of total operating expenses, according to level of volume and type of press. Depreciation was the second largest expense category. The higher expenses of operating standard and high density presses over that for flat presses largely were the results of greater original capital costs and the larger press crews.

In marketing channels, cotton shippers usually paid premiums for gin standard density bales over prices paid for flat bales. Such premiums were paid on 77 percent of such bales and averaged $1 a bale. In delivering cotton to southeastern mills, shippers reported net savings of 9 points a pound or 45 cents a bale for gin standard density bales as compared with flat bales which required compression. Charges for compressing flat bales averaged approximately $1.70 a bale but this saving was offset somewhat by most compresses levying a delivery and loading fee against gin standard density bales averaging 67 cents a bale. Charges or costs against these bales often go into a common purse where the gin, shipper, and compress belong to the same owner, a situation not uncommon in the West.

Compress operators on the whole reported that gin standard density bales arrived in better condition and required less space for storage than conventional or flat bales. In most physical handling operations, the gin standard density bales performed satisfactorily. Frequently, however, the standard density gin bales were more difficult to sample and to compress to high density than conventional bales.

Visits were made to selected cotton manufacturers which were sizable users of western cotton. Of the total purchases of such cotton in 1956-57 by this group, 35 percent was bought in the form of gin standard density bales and 65 percent as compress standard density bales. Consensus was that cotton from the two types of bales performed similarly in opening, picking, and carding. In general, this group of spinners regarded the gin standard density bale in a favorable light because of its symmetrical proportions, attractive appearance, and protective qualities, but not to the extent that would involve a premium in price.

No attempt was made to make a detailed study of the marketing of gin high density bales, which to date are largely an experimental package. Such bales, if pressed to true high density (32 pounds per cubic foot), have assured disposal only to foreign outlets. Currently any high density bale, whether formed at a gin or compress, is ineligible for the Government price support program, is subject to rejection by domestic mills, and is untenderable on futures contracts.

However, several domestic mills have found high density gin bales very satisfactory in trial tests.

When relative baling costs and revenue at the gin were balanced against compress charges, the break-even point between standard density and flat press operation was at the 6,500-bale level, and at approximately 8,000 bales for the high density press. Outside the West, few producing areas have many gins that consistently maintain such annual volumes.

Baling Cotton at Gins

Practices and Costs - Flat, Standard, High Density Bales

by J. D. Campbell and R. C. Soxman [1]

Following World War II, there has been a modest, yet slowly increasing, adoption of new designs of bale presses by ginners, particularly in the West. These newer types of presses turn out bales that are as dense or denser than the standard density bales compressed at warehouses. By the 1957-58 season, about 2 percent of active gins were operating such presses.[2] That season this small group of gins handled approximately 5 percent of the entire crop, a proportion greater than achieved by the round bale package (now abandoned) at its peak of popularity.

Aim of the study reported on in this publication was to evaluate the new gin bale presses for the cotton industry on the basis of costs and problems and practices their use may bring, and to investigate attitudes of manufacturers on density and types of bales.

Background of Study

The traditional American system of packaging cotton at gins has been criticized from the very beginning. The flat bales (13 pounds per cubic foot) made by gins must be moved to a compress and reduced in size before qualifying for minimum rates in being transported any appreciable distance. However, many believe that this established pattern is basically sound. The fact that this system has thrived during a century when radical change elsewhere was commonplace lends support to such belief. Less than 300 compresses, already in operation, provide readily accessible and adequate compression facilities for all producing areas and port locations. Otherwise several thousand gins would have to install new and very expensive presses to provide suitable coverage and facilities.

A compress machine operates very rapidly and in a few days can compress a volume of bales equal to the entire output of an average capacity gin during an entire season. Also compress equipment is located at all major public warehouses where bales customarily must be moved for storage and other essential marketing services.

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[1] Mr. J. D. Campbell is with Marketing Division, Farmer Cooperative Service. Mr. R. C. Soxman is with Marketing Economics Research Division, Agricultural Marketing Service.

[2] Soxman, R. C., and Robinson, A. C., Cotton Bale Coverings, U. S. Dept. of Agr. Mar. Res. Rpt. 303.

These plus other factors are advanced as evidence that the present system is less costly than any foreseeable modification.

Supporters of the newer types of gin presses that bale cotton to greater densities than do regular gin presses state that this method eliminates the need for compression for a majority of bales. Now about 95 percent of bales are formed as flat bales with an average density of about 13 pounds per cubic foot.

Throughout the report, regular or conventional bales are referred to by the type of density involved; that is, flat bales as formed at the gin; compress standard density when flat bales have been repressed by the compress to standard density; and compress high density for either flat or compress standard density bales which have been repressed for export.

The term "gin standard density bales" is used to distinguish these bales from standard density bales made by compresses.

Most flat bales are repressed at a compress to standard density (approximately 22 pounds per cubic foot) for domestic movement or to high density (about 32 pounds per cubic foot) for overseas shipment. Not uncommonly, flat bales are first compressed to standard density and later recompressed to high density at time of export.

Since cotton must be baled at the gin, many ginners and other believe that the initial job should provide a bale that is ready for any domestic market. Some go a step further and advocate a gin bale that is suitable for movement to any port of the globe. Among these general groups, consensus is that any added costs at gins are more than offset by savings in compression charges. Also mentioned are the tidy appearance and protective features of the new types of gin bales. These smaller gin bales are very symmetrical and can be more fully covered with the same weight of bagging now used in wrapping flat bales.

In view of these differences of opinion, many in the cotton trade have adopted a wary watch-and-wait attitude of neutrality. Those with a genuine interest in the relative merits of these two approaches to cotton packaging have had difficulty in appraising the facts in the case. At the Stoneville Ginning Laboratory of the U. S. Department of Agriculture, much valuable experimental work was performed with gin presses in the late 1930's and early 1940's in pressing cotton to standard density.[3] Only limited information, however, has been available on commercial costs of baling cotton by these alternate methods or on the performance of the different types of gin bales in marketing channels.

Objectives

Objectives of this study were broken down into four major points: (1) To appraise the nature and extent of problems encountered by ginners in pressing and handling bales according to type of density; (2) to provide information on comparative practices and costs in merchandising, storing, and transporting bales by type of density; (3) to investigate the attitudes of cotton manufacturers as to density and types of bale; and (4) to evaluate differences in costs to ginners in installing, maintaining, and operating conventional flat bale presses as compared with the more powerful newer types of presses.

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[3] Bennett, C. A., Harmond, J. E., and Shaw, C. S. Standard-Density Cotton Gin Presses, U. S. Dept. of Agr. Circ. 733, 1945; and Wright, J. W., Gerdes, F. L., and Bennett, C. A. The Packaging of American Cotton and Methods for Improvement, U. S. Dept. of Agr. Cir. 736, 1945.

Methods and Scope of Study

Study was limited to gins in Arizona and California, where most of the newer types of presses were located. See appendix table 1 for location of presses. The types of gin presses included in the study were (1) flat bale, (2) standard density, and (3) high density.

In 1956-57, a total of 17 gins in the Arizona-California area with standard density presses were selected for study. This group was one-fourth of such gins in the area and provided a representative cross section as to press design. Arrangements also were made with 18 gins with flat bale presses to participate in this study.[4] During 1957-58, study was limited to three gins in California with high density presses. According to available information, these three gins were the only ones in the Cotton Belt that season using this type of press.

The 38 gins studied were as alike in age and capacity as could be selected to provide adequate representation of the several types of presses. As to ownership, there were consistent differences according to type of press. Of the 18 flat bale press gins, 13 were custom gins and 5 were operated cooperatively by growers. Among the standard density press gins, 10 were cooperatives and 7 were custom. All three high density presses were operated by California cooperative gins. In California, where the largest concentration of new type gin presses was found, the great majority of these was at cooperative gins. In Arizona, the major portion of new type presses was in custom gins.

Separate electric meters were placed on press pump motors at all 38 gins and on trampers, when powered independently. Contracts were made with local utility companies to read these sub-meters monthly and record electric power requirements in baling.

Gins were visited in midseason to observe and time the pressing and tying-out of bales. Linear measurements of 80 bales at each gin were made with commercial bale calipers and weights of these bales were recorded to allow calculations of bale densities. After the close of each season, information was obtained from gin records on man-hours, wage rates, repairs, and other operational expenses. Total taxes, insurance, and other items of fixed costs also were secured for apportionment to the baling operation.

Following the 1956-57 season, visits were made to compresses, offices of cotton shippers, and selected domestic cotton mills. They provided data on the relative practices, problems, and costs, where available, involved in warehousing, marketing, and consuming conventional bales as compared with gin standard density bales. A like followup was not attempted in 1957-58 for the much smaller volume of gin high density bales.

Since the period of study, indications have pointed to greater interest in the more costly designs of presses and to increases in the general price level. Under such circumstances, actual costs for a fixed period diminish in practical value with the passage of time. For these reasons, we used the model method to analyze the installed costs and operating expenses for the several types of presses.

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[4] Size, volume, and age of participating gins are shown in appendix table 2.

Study of Gin Presses

This section includes information obtained on gin standard density and flat bale presses for 1956-57 and on gin high density presses for 1957-58.

Gin Standard Density and Flat Bale Presses, 1956-57

After discussing gin baling equipment, this section covers the operational features of the bale presses.

Gin Baling Equipment

Of the 17 gins baling to standard density, 16 had the more modern press boxes measuring 20 by 54 inches, and the other had the older type of box measuring 20 by 50 inches.

Until recently these presses normally were powered by 3 rams about 9 inches each in diameter. Later models usually have had 4 rams of like diameter. In the study sample 10 of the 17 gins had 3-ram presses, 6 had 4-ram and 1 had 1 large ram of 17-3/8 inches diameter.[5] This latter press was combined in statistics with the group of 4-ram presses.

Pumps of 3-ram presses were driven by electric powered motors averaging 46 horsepower per gin (table 1). At the 4-ram gins, press pump motors had an average rating of 69 horsepower per gin.

The 18 flat bale presses at gins studied were typical of those to be found elsewhere in gins of like age and high volume capacity. All had steel boxes measuring 27 by 54 inches. These presses had 1 ram, 8-3/8 inches in diameter. The rating per gin for press pump motors was 15 horsepower, or

Table 1. - *Cotton gin bale press: Size of electric motors used in press and tramper operation by type of press, 35 selected gins in Arizona and California, season 1956-57*

Type of bale press	Size of motors used in operating			
	Press pump		Tramper[1]	
	Gins	Average motor rating per gin	Gins	Average motor rating per gin
	Number	*Horsepower*	*Number*	*Horsepower*
Flat	18	15	7	13
Standard density:				
3-ram	10	46	6	18
4-ram	7	69	7	19

[1] At some gins trampers were not operated by separate power units.

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[5] For these newer 1-ram presses the frame and box have been engineered for high density operation but the 1 ram and pumps are intended for standard density operation. Such presses can be converted to high density by addition of another ram and additional hydraulic capacity.

Table 2. - *Gin press operation: Size of crew and time required in baling cotton by type of press, 35 selected gins in Arizona and California, season 1956-57*

Type of bale press	Men in press crew	Time required to press bales			Time required to tie-out bales		
		Average	High	Low	Average	High	Low
	Number	*Seconds*					
Flat	2.1	78	121	72	70	131	52
Standard density:							
3-ram	2.5	109	118	103	84	125	68
4-ram	2.7	105	111	104	73	95	60
Average	2.6	108	115	103	79	112	64

only about one-fifth that required for 4-ram presses and approximately one-third that for 3-ram presses.

Because of the smaller area of the standard density boxes, such presses used heavy duty trampers. Also a larger proportion had separate tramper motors than did flat bale presses. All of the 4-ram presses had separate tramper motors as did three-fifths of the 3-ram presses. Only slightly more than one-third of the flat bale presses used separate power for trampers. At standard density gins, tramper motors averaged 18 horsepower or about one-half greater than at flat bale presses that were so equipped.

Aside from size of motors and number and size of rams, standard density presses had boxes and supporting frames which were of much heavier construction than flat bale presses. Some comparison of differences was supplied by shipping weights.[6] Flat bale presses had a shipping weight of about 28,000 pounds, as against 45,000 pounds for a 3-ram press and up to as high as 80,000 pounds for some designs of 4-ram presses.

Operational Features of Bale Presses

Covered in this section are size of press crews, time required in baling, loss of time through press repairs, and charges to growers by type of press.

Size of Press Crews. - Crews at standard density presses averaged from one-fourth to about one-third larger than at flat bale presses (table 2). Two-man crews were customary at flat bale presses. The 3-ram presses were manned about equally with either 2-man or 3-man crews. At presses with four rams, 3-man crews were used at about two-thirds of the gins. Where 3-man crews were maintained, one man sometimes had part-time duties such as helping with the lint cleaners, automatic sampler, or the like.

Time Required in Baling. - Time records made during the study showed that 108 seconds, on the average, were required to press a standard density bale, or about 30 seconds greater than for a flat bale.[7] Among the standard density presses, pressing times at 3-ram and 4-ram presses were practically the same. Each gin, regardless of press type, was very consistent in pressing time for the great majority of bales. Upon occasion, when a flat bale press was working on an extremely heavy bale, operation was slowed down to a slightly greater extent than at standard density presses.

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[6] Shipping weights included press, tramper, pumps, valves, fittings, and motors.

[7] Tare, dimensions, weight, and densities of flat and gin standard density bales are described in appendix tables 3 and 4.

Average time required to tie out standard density bales was 9 seconds in excess of that for flat bales. At the 4-ram presses, bales were tied out in 11 seconds less than at 3-ram presses, apparently because of the larger size of the crew. In all cases, crews at standard density presses had to apply from one-third to one-half more ties per bale as compared with workers at flat bale presses. Again when difficulty did arise with flat bales, the maximum tie out time exceeded that for standard density bales.

The total average time necessary for pressing and tying out gin standard density bales was 187 seconds or 39 seconds greater than required for flat bales. After the bale is removed from the press, two other operations remain before the press can be turned to complete the baling cycle. One is dressing the emptied press with two strips of bagging and the other is the return of ram or rams to down position.

These operations were not timed but they were observed closely. It was estimated that about 10 more seconds were used in dressing standard density presses as against flat bale presses. In returning rams to down position, no noticeable difference was observed according to type of press. Altogether, for the entire baling cycle, it was estimated that 1 additional minute was used at standard density presses as compared with flat bale presses. Apparently this added time did not cause a slowdown in rate of gin operation.

Occasionally a bale, usually one of extra heavy weight, loses a tie or two after being released from the press. At the study gins in 1956-57, the number of bales that required rebanding before leaving the gin house averaged six bales per gin for flat bales, one bale per gin for the 3-ram presses and two bales per gin at 4-ram presses. This number was small in all cases for an entire season.

Loss of Time through Press Repairs. - Estimated downtime at study gins during the 1956-57 season caused by breakdown of the press assembly, including tramper, averaged 5 hours per flat bale press, 17 hours per 3-ram press, and 7 hours per 4-ram press. Causes of loss ginning time resulted from a wide variety of mishaps at flat bale and standard density presses, at the latter, tramper breakdowns were a significant factor.

Charges to Growers by Type of Press. - Charges to growers for ginning and wrapping were highly similar throughout the Arizona-California area in 1956-57. About two-thirds of the study gins made an overall charge of $1 per hundredweight of seed cotton, this sum including bagging and ties, drying of seed cotton, lint cleaning, and 20 days storage and insurance for the bale on the gin yard. The remaining gins chiefly charged 80 cents a hundred pounds of seed cotton, plus 10 cents a hundred both for drying and for lint cleaning, with other services included as above, which added up to the same $1 per hundredweight for most bales.

Among study gins, those with standard density presses charged the same rate for ginning services as did gins with flat bale presses in the same territory.

Gin High Density Presses, 1957-58

Outside the United States, particularly in Brazil, many gins turn out high density bales, those with a density of 32 pounds or more of cotton per cubic foot. In Brazil, however, bales usually weigh about 400 pounds. Now gin presses have been developed to produce high density bales from the 500-pound average bales in this country. At this time, however, use of gin high density presses in the United States may be considered as experimental, from the standpoint of both press operating practices and the marketing of the resulting bales.

Characteristics of Press and Bale

The high density presses studied in 1957-58 had boxes of the same dimensions as most standard density presses, 20 by 54 inches, the greater bale density being achieved by turning out a more tightly pressed or thinner bale. Two of these presses each had 2 rams of 17-3/8 inches in diameter. The other was a 4-ram press especially designed with 2 rams for up-packing and 2 for down-packing.

All these presses were of massive construction, heavily reinforced at stress points. Pumps at each of 2 presses were driven by electric motors with a combined 150 horsepower. At the other press the hydraulic system had motors with a total of 100 horsepower. On the average, press pumps at these high density gins utilized motors with double the horsepower at 4-ram extra density gins and about 10 times greater than at flat bale gins.

Bales at high density gins were pressed to very uniform thicknesses, generally varying only 1 inch and averaging 23.7 inches for those actually measured. Dimensions were approximately 21 x 55 x 24 inches. Such bales were the same length and width as most gin standard density bales but were about 7 inches thinner.

All three gins wrapped bales almost exclusively in sugar-bag cloth. Two gins put 9 ties on each bale and the other gin used 10 ties per bale, ties at all gins being 82 inches in length. Tare on these bales averaged about 21 pounds, or the same as for both flat and standard density bales.

Average density of bales selected at random was approximately 31 pounds per cubic foot or about 1 pound under the 32-pound trade standard for high density cotton. Weights, however, of the 240 randomly selected bales averaged only 486 pounds. Indications were that bales averaging more than 500 pounds would have provided an average density of 32 pounds per cubic foot. Because of the uniform thickness of these bales, densities varied directly with bale weights ranging from as low as 25 pounds for bales weighing 400 pounds or less up to 38 pounds or more for bales in excess of 600 pounds in weight.

These bales commonly were referred to as "little" bales and generally were not publicized as high density cotton. Indications were that failure to achieve high density consistently at these presses was not due to any mechanical shortcomings of the equipment. Instead, uncertainties in the marketing of such cotton apparently encouraged operation of the presses in a borderline manner as far as density is concerned. Marketing considerations peculiar to actual gin high density bales are discussed further along in the text.

Operational Features of Presses

Each of these high density presses was served by a 3-man crew. These powerful presses required only an average time of 95 seconds a bale for pressing a bale, only 17 seconds in excess of the time required in pressing flat bales and 13 seconds less than the time consumed in pressing gin standard density bales. Observed time requirements in tying out the high density bales was 91 seconds, or 21 and 12 seconds greater than for flat bales and standard density bales, respectively. Apparently the time required in the total baling cycle at high density gins did not interfere with the rate of ginning.

High density bales held ties well after leaving the press. At two of the gins no bales required replacement of any ties either before leaving the gin house or after storage was completed on the gin yard. At the third gin minor trouble was experienced with tie failure but this resulted almost exclusively from experimentation with a new type material.

The average charge for ginning at these three plants was $1.07 per hundredweight of seed cotton, including cleaning and conditioning, bagging and ties, and 20 days storage and insurance on the gin yard for the bale. This level of charges to growers was the same as made by gins with either flat or standard density presses in the same area.

Handling and Marketing Bales

This part of the report discusses the handling and marketing of conventional and gin standard density bales, and gin high density bales.

Conventional and Gin Standard Density Bales

After describing storage and handling at gin yards, this section examines warehousing and shipment of bales, and the practices of shippers in marketing.

Storage and Handling at Gin Yards

In the West, cotton customarily is stored in gin yards while under ownership of growers. First-buyers, also make extensive use of such storage. In providing this important local storage service, western ginners engage in the physical handling of and accept custodial responsibility for cotton bales to a much greater extent than in most other parts of the Belt.

According to participating ginners in 1956-57, storage practices and length of storage did not differ noticeably by type of bale. Of the 17 ginners operating standard density presses, about one-half stated that such bales were easier to handle and store than flat cotton. Most others rated the two types of bales about equal in overall performance, although several ginners said that standard density bales were more difficult to handle manually than flat bales because of their greater density.

Advantages cited for the standard density bales chiefly centered on their small size and resulting economy in use of storage space. A number of ginners also believed that these bales were much less subject to being fire-packed than flat bales. The heavier pressure required in pressing and the greater density of the bale were thought to extinguish any smoldering bits of cotton entering the bale during ginning. Under like circumstances, experience was that combustion was apt to continue internally within flat bales until fire reached the outer surface, creating serious hazards to surrounding bales as well.

Only four ginners operating flat bale presses felt qualified to make comparisons. Two ginners favored flat bales because crews thought they were easier to handle than the more compact standard density bales. The other two ginners preferred storing standard density bales because of reduced fire risks.

Upon completion of the storage period, ginners occasionally had to replace bale ties lost during storage. At the 18 flat bale gins, an average of 6 bales a gin required some replacement of ties before leaving the yard, as compared with 8 bales a gin at the 17 standard density gins.

Growers at gins studied, regardless, of bale type, delivered cotton to marketing agencies almost exclusively at gin yards. Bales, therefore, chiefly left the gin yards after control or ownership had passed from growers.

More than 99 percent of the cotton leaving yards of gins with both types of presses moved to nearby warehouses almost exclusively by truck. One popular type of truck hauling, a truck-trailer combination, carried average loads of about 72 flat or 86 gin standard density bales. An average load for another common rig, a 35 foot x 8 foot semitrailer, was about 63 flat or 77 gin standard density bales. In spite of the heavier payload provided by gin standard density bales as against flat bales, rates charged for hauling both types of bales to a common destination were the same, according to available information.

Warehousing and Shipment of Bales

As indicated previously, most cotton bales, regardless of whether or not compression or storage are required, enter a compress or warehouse for other essential services including issuance of negotiable receipts, weighing, sampling, consolidation, and loading. Any change in bale form or density should increase the efficient performance of such services and physical handling.

Information was collected from 36 public cotton warehouses concerning the handling of gin standard density bales during the 1956-57 season compared to conventional bales. These warehouses, customarily referred to as compresses, all maintained compression equipment. Twenty of these compresses were located in Arizona and California and received the bulk of their cotton by truck direct from gin yards either as flat or gin standard density bales.[8] The other 16 compresses were in Houston, Galveston, New Orleans, and Memphis, which are important cotton concentration centers.[9] There compresses not only received local cotton but also numerous fully loaded cars from origins as distant as California and Arizona for concentration -- unloading and interim storage until the cotton was reshipped either to domestic mills or shipside.

Local Compresses. - The 20 compresses within the study area reported receiving about 382,000 gin standard density bales during 1956-57. Of this total, 87 percent was received for storage and the remainder was for consolidation. Following the relatively recent advent of gin standard density presses, compresses in Arizona and California have lost some revenue by not receiving compression charges on such bales that move eastward by rail.

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[8] This number included all but one of the compresses known to be located in the area.

[9] This group of compress firms, representing about two-thirds of such firms at these locations, were selected on the basis of wider experience with gin standard density bales.

The majority of these compresses estimated that fewer gin standard density bales were received with missing ties than flat bales. As for handling and service operations, about one-half or more of the compresses stated that performance was about the same for the two types of bales (table 3). At 40 percent of the compresses, however, greater difficulty was experienced in unloading gin standard density bales from trucks and 45 percent reported more time consumed in sampling than for flat bales. As several compressmen mentioned, gin standard density bales chiefly were being handled by equipment and under procedures geared to requirements of flat bales. In sampling, the greater number of ties on gin standard density bales and their spacing as compared with flat bales allowed less sampling area.

Seventy percent of compress operators indicated that savings of 25 to 30 percent in covered storage space were possible in storing gin standard density bales as against a like number of flat bales. Except, however, for a few compresses receiving gin standard density bales in large volumes, these potential savings in space were not utilized. Covered storage space was not a critical factor in the 1956-57 season. Also, aisles and compartments had been laid out especially for storing flat bales. At practically all compresses, both types of bales were stored according to the same pattern head-on-head two or three bales high.

When storage space becomes critical, flat cotton is usually compressed to standard density to conserve space without orders from owners. Under such conditions, gin standard density bales may offer a distinct saving to the compress, even if later compressed for export.

These 20 compresses during 1956-57 compressed 157,225 gin standard density bales to high density, an amount equivalent to about 47 percent of such bales received for storage. Sixty percent reported that gin extra density bales slowed up compression time as compared to flat bales chiefly because of the different practices necessary in removal of ties preparatory to compression. Ties of flat bales were removed rapidly by use of dinky presses while

Table 3. - *Cotton bale handling: Comparative performance of gin standard density and flat bales in warehousing operations, 20 selected warehouses in Arizona and California, season 1956-57*

Type of operation	Handling characteristics of gin standard density bales in comparison with flat bales			
	Easier	About same	More difficult	Total
	Number			
Unloading	1	11	8	20
Weighing	1	16	3	20
Sampling	1	10	9	20
Stacking	3	14	3	20
Breaking-out	-	15	5	20
Movement by:				
Clamp truck	3	12	5	20

most compresses had to cut ties on the gin standard density bales, thereby using more labor and losing some ties for reuse.

Sixty percent of the compressmen indicated that gin standard density bales were easier to load in rail cars than compress standard density cotton, since they were more symmetrical in proportion and would rest solidly upright on head. Rail carloadings averaged 106 bales per car for both types of bales.

General comments on the gin standard density bale varied widely. Of the 20 units, 5 offered no comments, 5 were wholly unfavorable, 5 were favorable as far as warehousing operations, and the remaining 5 offered pros and cons for gin standard density bales. One main complaint revolved around difficulties of handling and compressing the denser gin bale under a system developed for flat bales. Objections to the gin standard density bale as a package related mainly to the lack of uniformity in number and spacing of ties among gins and the loss of buckles and ties for reuse or normal resale.

Loss of revenue by compresses in Arizona and California from handling gin extra density bales apparently has not been as great as popularly supposed if the 1956-57 season was anywhere near typical. In the first place, compression was performed on very nearly one-half the gin standard density bales. Secondly the loss in revenue on the eastward rail movement of such bales where no compression was performed was partly recouped by a special charge made when cotton was not compressed. Of the 20 compresses, 12 listed an additional charge for loading bales not compressed ranging from 50 cents to $1 per bale and averaging 67 cents.

Most units of the compress industry base charges for handling, weighing, sampling, and storage on the assumption that revenue will result from compressing each flat bale entering plants for storage. If a bale received flat is ordered shipped flat, a special delivery charge generally is applied to compensate partly for loss in compression revenue.

In Arizona and California, most compress tariffs now include a special charge for bales moving in or out of storage without being compressed, whether flat, compress standard density, or gin standard density. Since compresses located in the interior normally receive very little compressed cotton and seldom ship flat bales, this charge applies almost entirely to gin extra density bales and increases the cost of marketing such cotton when and where levied. This type of charge, however, was in effect at many interior compresses in the area before gin standard density bales were commonplace.

These extra charges may carry the outward appearance of being chiefly a retaliatory measure aimed at gin standard density bales. Actually, during the season of study, rather convincing argument could be marshaled that the prevailing extra charge was justified. All types of bales received for storage were charged $1 a bale for handling which usually included unloading, tagging, sampling, weighing, placing in storage, and loading out if compressed.

Loading of bales following compression, however, is not a difficult task since all bales in the lot already are assembled within a short distance of the loading dock. When a lot is ordered compressed and shipped, a major physical handling operation is the breaking out of individual bales from stacks scattered throughout the plant, and the movement of these bales considerable distances for assembly into a block at the press.

This somewhat costly breaking-out operation was considered as part of the expense of compression for which a total charge was made of about $1.70 a bale. When a carlot of gin standard density bales was ordered shipped, the same breaking-out movement and assembly was required. Since the original $1 a bale handling charge largely applied to services already performed, the additional average charge of 67 cents a bale was made. Thus, a compress grossed about $2.70 a flat bale (excluding storage) for receiving, handling, compressing, and loading-out. Similar services for a gin standard density bale other than compression brought in $1.67 a bale on the average.

Compresses at Major Concentration Centers. - The 16 compresses visited in Houston, Galveston, New Orleans, and Memphis received a total of about 119,500 bales of gin standard density cotton in 1956-57. Practically all such receipts arrived by rail for concentration. So far, compresses in these locations have not lost any significant revenue due to receiving such bales.

Operators of these compresses reported that, on the average, rail cars of gin standard density bales arrived in better condition than compress standard density cotton. Estimated proportions of compress standard density bales with missing ties were about three times greater than for gin standard density bales. In unloading and other routine operations, gin standard density bales were rated as either easier or about the same in handling characteristics as compress standard density bales except in the case of sampling (table 4). The gin standard density bales were especially favored in unloading, stacking, and breaking-out, and in movement by clamp trucks.

Among these 16 compresses, only seven estimated gaining any material savings in space through storing gin standard density bales. The other nine plants received too few of such bales to gain any practical benefit. At a majority

Table 4. - *Cotton bale handling: Comparative performance of gin standard density bales and compress standard density bales in warehousing operations, 16 selected compresses in Houston, Galveston, New Orleans and Memphis, season 1956-57*

Type of operation	Handling characteristics of gin standard density bales in comparison with compress standard density bales			
	Easier	About same	More difficult	Total
	Number			
Unloading	9	7	-	16
Weighing	4	12	-	16
Sampling	3	9	4	16
Stacking	9	7	-	16
Breaking-out	10	6	-	16
Movement by:				
Hand truck	5	9	2	16
Clamp truck	9	7	-	16

of the compresses, gin standard density bales were stored head-on-head, two to three high.

This group of compresses together compressed about 80,500 gin standard density bales to high density during 1956-57 with much of this cotton representing bales received in prior seasons. Among the 16 units, 7 preferred to compress the conventional density bales, 6 favored working the gin standard density bales, and 3 stated that performance was about the same.

Disadvantages cited in compressing gin standard density bales revolved largely about the lack of uniformity in these bales. The fact that such bales came in two sizes complicated handling and greater care was required in centering the smaller sizes in the press. Also several types of buckles were encountered with varying problems in removing ties. Advantages mentioned included the symmetrical proportions of such bales, and the belief by some operators that these bales could be pressed at a slightly faster rate than conventional bales.

Practically all of these compressmen stated that gin standard density bales were easier to load into rail cars than compress standard density bales, advantages being the same as outlined by plants in the study area. Estimated carloadings averaged 111 bales a car for gin standard density bales and 109 bales for regular standard density bales.

Charges assessed at these 16 compresses for various services were identical for concentrated cotton regardless of bale type. Shippers moving cars of both gin and compress standard density bales into and out of such plants incurred equal costs for comparable storage time and services.

In all cases, gin standard density bales were rated as from good to excellent for all storage and physical handling operations other than compression. Several operators stated that minor differences encountered in compressing these bales likely could be ironed out with more experience.

Suggested improvements in this gin bale package included uniformity in bale size, standardization of buckles, preferably a type suitable for reuse, and adoption of a standardized number and spacing of bale ties. Several large compresses estimated that for each gin standard density bale compressed, the loss was about 10 to 15 cents a bale on buckles and ties as compared with a regular standard density bale.

Practices of Shippers in Marketing

During the 1956-57 season, excluding cotton entering the Government loan, growers patronizing study gins delivered about two-thirds of the standard density bales to marketing cooperatives and sold the remainder outright. Of the flat bales from participating gins, not entering the loan, about three-fourths were sold outright and approximately one-fourth were handled through cooperatives.

Toward the close of the 1956-57 season, information was obtained from 29 cotton shipping firms maintaining offices in California and Arizona.[10] These firms had purchased or received a total of 341,117 bales of gin standard density cotton.[11] Fifteen of these firms handled less than 5,000 bales each an 1 firm, a marketing cooperative accounted for more than one-half of the total.

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[10] This number representing all except two firms known to have marketed any appreciable volume of extra density bales in the study area.

[11] This volume represented available information on such bales originating from the entire group of 68 gins in Arizona and California that were equipped with standard density presses.

Among these 29 firms, 7 reported making a special effort to buy gin standard density bales. On the other hand, one firm indicated that flat bales were definitely preferred over the denser gin bales.

Shippers frequently paid a premium for gin standard density bales as compared with prices on flat bales of like quantity cotton. A total of 17 firms reported paying premiums on all or a part of their purchases of gin standard density bales. Of the 341,117 bales of such cotton, about 77 percent was acquired by shippers at premium prices of from 8 to 30 points a pound above prices paid for flat bales. Premiums, when paid, averaged approximately 20 points or about $1 a bale. Nine firms paid an added price for all gin standard density bales and eight firms on a part of such purchases.

Eleven shippers bought gin standard density bales at the same prices prevailing for flat bales but mostly handled the denser gin bales in minor volume. One shipper, doing an export business, penalized gin standard density bales 3 points a pound as contrasted with prices for flat bales.

Of the total volume of gin standard density bales, about 56 percent was delivered to domestic mills and 38 percent was exported. The remaining 6 percent was sold to other shippers.

In loading cotton for Carolina Group B (201) mills, shippers reported net savings in delivering gin standard density bales as against regular bales that ranged from 2 to 30 points per pound. The average saving was 9 points or 45 cents a bale.

When present types of gin standard density presses were coming into use, other savings besides compression were anticipated. Possible economies were foreseen in transportation charges and in assembly by loading full carloads at or near gins for direct shipment to mills. Savings in transportation costs for gin standard density bales, either by truck or rail, had not materialized in the study area. Five shippers did assemble and load a total of about 98 cars at gin rail heads, but this was a mere trickle compared with the total movement of such bales.

Even if compression was not needed, shippers normally required other services available at compresses such as commercial weighing, sampling, consolidation, and loading into cars. Gin standard density bales, therefore, moved into such facilities in about the same proportions as flat bales.

More than one-fifth of the gin standard density bales delivered to domestic mills by these shippers were moved to compresses under consolidation privileges. In such cases, bales were stored on gin yards until put up for mill shipment and were then moved to the compress for immediate loading into carlots for shipment without incurring certain charges for handling (receiving) and storage. In this general area, however, flat bales also were often moved to the compress under compression-in-transit rules, thereby arriving for immediate compression and out-loading and realizing comparable savings in handling and storage charges.

As reported by shippers, savings, if any, in marketing gin standard density bales domestically were realized almost exclusively through elimination of the charge for standard density compression. This saving averaged about $1.70 a bale but was reduced by whatever premium had been paid for such bales over prices for flat bales, usually about $1 a bale. Also offsetting some of the savings from compression charges was the additional charge levied by some compresses on bales which were received from storage and later shipped without compression. As previously discussed, such charges when made ranged from 50 cents to $1 a bale.

This set of circumstances accounted for the average net saving of 45 cents a bale reported by shippers in delivering gin standard density bales to group B mills as compared with flat bales requiring compression. Under the most favorable conditions, the gain was approximately $1.70 a bale. At the other extreme, shippers paying top premiums for standard density bales plus the highest rate of compress delivery charge, were out of pocket a slightly larger sum than represented by the ultimate saving in compression. In the cotton shipping business, however, 9 points a pound or 45 cents a bale is considered a highly significant figure.

The net effect of cost differentials for the two types of bales apparently would be influenced somewhat by extent of integration involved. A firm operating solely as a shipper that paid premiums at the gin for standard density bales over flat bales or special handling charges at the compress presumably would be faced with a somewhat different net return than would be the case when the gin, the shipping business, and the compress were part of the same organization.

In delivering gin standard density bales to domestic destinations, shippers had about two-thirds of the total ordered out in solid carloadings as such bales. Sixteen of the 29 firms kept identities of gin standard density bales preserved on stock records.

When exported, gin standard density bales occasionally were at a cost disadvantage as compared with regular bales. With nominal exceptions, gin standard density bales, if exported, were compressed to high density at an average charge of about $1.75 a bale just as were all regular bales. Any firm paying $1 a bale premium for gin standard density bales because they were at standard density, then paying for high density compression, was faced with a higher cost than for flat bales when compressed directly to high density.

On the whole, shippers reported that gin standard density bales were well received by mills here and abroad. When asked for comments, six firms saw no particular advantage or disadvantage with the gin standard density bale. Four shippers did not like the denser gin bale because of possibly higher costs if exported and because of added bookkeeping in keeping up with two types of bales. Nineteen firms said that this type of bale had one or more advantages in domestic selling. Favorable features mentioned were savings in storage space and assembly time and the neater appearance and better protective covering as contrasted with regular bales.

Gin High Density Bales

Ginners stated that high density bales were a very satisfactory package for physical handling and storage. Bales from all three gins left the gin yards by truck for movement to nearby compresses.

No attempt was made to make a detailed study of the marketing of gin high density bales. Under the framework of the present marketing system, however, several factors are not particularly favorable to any immediate sizable trend to this type of bale. A very important consideration is density. On this score, this package is caught between two very tough jaws of a rigid vise. If bales do not attain proper density, they are subject to a penalty of 25 cents per hundredweight of lint at time of export. If the bales are pressed to a density of 32 pounds or greater per cubic foot and are not exported, they are not eligible for the Government loan. Although several domestic mills have made trial tests of gin high density bales and have found them to perform very satisfactorily, it is not safe to assume that all mills would accept such cotton. Under mill rules, spinners may reject high density cotton.

Also because of their smaller head surface, gin high density bales cannot be stacked routinely head-on-head three high as can standard density gin bales. When cotton is stacked only two high, however, the smaller high density bale actually requires less space than gin standard density bales.

In theory, a gin bale with a "universal" (high) density is the ideal package and would do much toward improving the marketing of American cotton here and abroad. Theory sometimes overruns the practical side. Under present trade rules and practices, the current gin high density bale would seem a trifle ahead of the times.

Attitudes of Selected Cotton Manufacturers as to Type of Bale

Visits were made to 16 cotton manufacturing firms in the Southeast after completion of the 1956-57 season. This group of mills was selected as representing a cross section of domestic consumers of gin standard density bales. Together, these mills reported buying about 400,000 bales of western cotton in 1956-57 of which approximately 140,000 were gin standard density bales.

Of the 16 firms, only 1 had made any special effort to obtain standard density gin bales when purchasing western cotton. This firm had acquired cotton chiefly by direct purchase and was able to realize a slight saving in landing such cotton as against buying flat bales and having them compressed.

Practically all firms reported that upon arrival gin standard density bales had fewer missing bands, were more fully covered by bagging, and were more attractive in appearance than compress standard density bales. Indications, however, were that these differences were not regarded as significant to mill operations.

Opinions of mill personnel varied somewhat as to the relative handling qualities of the two types of bales. In operations such as stacking, breaking-out and handling bales by clamp truck, the majority of mills favored gin standard density bales over the compress standard density bales (table 5). Also in unloading and weighing cotton, preference was stated, on the average, for the gin standard density bale. But in sampling and in movement by hand truck, compress standard density bales received more favorable comment than the gin standard density bales.

Thirteen of the 16 firms estimated that gin standard density bales made savings possible in warehouse space of from 5 to 33 percent in comparison with

Table 5. - *Cotton bale handling characteristics: Comparative performance of gin standard density and compress standard density bales in physical handling operators, 16 selected cotton manufacturers, season 1956-57*

Item	Mills expressing comparisons for gin standard density bales in contrast to compress standard density bales		
	Easier	About same	More difficult
		Number	
Unloading	8	4	4
Weighing	5	9	2
Sampling	2	8	6
Movement by:			
Clamp truck	10	5	1
Hand truck	5	6	5
Stacking	13	2	1
Breaking-out	7	9	0

that required for a like number of compress standard density bales. At most mills, however, warehouse space was not a critical factor and this potential economy was not deemed important.

Three firms reported greater difficulty in removing ties from gin standard density bales than from compress standard density bales. One of these mills has gone so far as to equip the crew with safety gloves and goggles.

Practically all mills commented on the exceptional resiliency of gin standard density bales after ties had been removed. Bales at times would fluff up so high that they would topple. With experience all mills but two had developed a routine method of handling generally by placing gin standard density bales side by side or else dividing each bale into two piles. One mill, however, used an extra man when opening the gin standard density bales and another was considering reducing the size of the mix.

Fifteen of the 16 mills cleaned the surfaces of bales to varying extents prior to processing. One mill cleaned only the compress standard density bales and not the gin standard density bales. All others paid no attention to the type of bale but stated that type of bagging often was a factor. Bales covered with open-weave jute tended to require cleaning more frequently and more extensively than those wrapped with sugar-bag cloth. Several mills did mention that because of the greater surface area covered by bagging, gin standard density bales not uncommonly could be cleaned a trifle quicker and with removal of a little less cotton than for compress standard density bales. This saving, however, was labeled as nominal or very minor since the overall cleaning cost usually was small.

At all mills, gin standard density bales were laid down in mixes including compress standard density bales. Consensus was that cotton from the two types of bales performed similarly in opening, picking, and carding.

When asked if bales pressed to high density at gins would be readily acceptable, four firms replied "yes," three were doubtful, and nine were opposed to any increase in density regardless of where and how pressed. The belief was that denser bales would require more opening machinery or additional floor space in the opening room than now required for bales of current density.

Several mills stated that a single type of package was desirable since some disadvantages were encountered in the present mixture. On the whole, this group of mills appeared to regard the gin standard density bale in a favorable light but not to the extent that would involve paying a premium in price for them.

Computed Costs and Operating Expenses of Model Bale Presses

A cotton ginner who is thinking of installing a standard or a high density bale press in a new gin instead of the conventional flat bale press, or of replacing a flat press in an existing plant with a higher density press, necessarily considers the additional capital investment and the increased operating expenses required. The analysis in this section provides information on comparative installed costs and operating expenses of bale presses by density type.

Information on bale press installation costs and operating expenses were obtained for the 1956-57 season from 18 gins equipped with flat presses and 17 with standard density presses, and for the 1957-58 season for 3 gins equipped with high density presses.

It was recognized that the installed cost of bale presses reported by study gins might either overstate or understate 1958 differences in costs between density types of bale presses. The year installed, and increases in the f.o.b. factory price, as well as variations in the cost of installation labor and materials, were reflected in the reported installed cost.

Operating expenses, likewise, as reported by the gins, varied with location, volume, depreciation rates used, power types and rates, wage rates, insurance and tax rates, length of ginning season, efficiency of employees, and more particularly with the capabilities of individual gin managers. Any such differences in operating expenses might or might not be due to the type of bale presses in these gin plants.

Adapting Study Data to a Model Plant Analysis

A modified type of model plant analysis was used in this study to eliminate or minimize variations in the installed costs and operating expenses of bale presses reported by participating gins. This model approach was designed to adjust for variations in capital costs of bale presses by density type and to standardize operating rates and prices on a uniform time basis.[12]

Differences in installed costs and operating expenses between density types of bale presses, as shown by the model method of analysis, are considered more comparable than are such differences between unadjusted study data by type of press. It was for these reasons that the model plant method was used to compare the installed cost and operating expenses of bale presses of different density types. Any differences in the installed cost or the operating expenses between types of bale presses in a model plant method of analysis are due entirely to the type of presses.

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[12] No attempt was made to inject any aspects of differences in levels of efficiency other than that reflected in the basic data obtained from study gins.

A basic assumption was made that new flat, standard, and high density bale presses were installed in 1958 in three gin plants located in the San Joaquin Valley of California. Except for bale presses, these three gin plants were identical in all other respects.

It was further assumed that these three gin plants with different density type bale presses were operated during the 1958-59 ginning season. Estimates of operating costs and expenses were developed at six levels of volume ranging by 1,000-bale intervals from 4,000 to 9,000 bales. Each of these six annual volumes was assumed to have been ginned by each of the three plants in a 6-month period, and the percent of total volume ginned by months was held the same for all six annual volumes.

Operating expenses of all three bale press types were computed at uniform rates except for differences due solely to the type of press. Expense factors that were the same for all press types included annual rates for insurance, taxes, depreciation, interest on investment, wages, and power. The rate of ginning was the same for all types of presses at any given volume but varied with volume. Factors that varied with type of press were the 1958 installed cost, number of men in press crews, kilowatt hours of electricity consumed per bale, expenses for press repairs and supplies, and cost of bagging and ties. All of these factors and rates except depreciation and interest on investment were determined directly from data reported by the gins. These data from the gins are summarized in the appendix tables 5 to 19, inclusive. An explanation is also made in the appendix of methods followed in using study data from the survey.

Data obtained from the gins on installed costs and operating expenses of bale presses were classified into the four types of bale presses with which these plants are equipped. These were: Flat, 3-ram standard density, 4-ram standard density, and high density.

Only three of these density types of bale presses were considered in the model analysis -- flat, standard density (4-ram), and high density. The 3-ram standard density press was omitted for two reasons. First, this press turns out bales of the same size and density as the 4-ram standard density, and second, some of the earlier 3-ram presses were subsequently modified by being made heavier in several respects. These modified 3-ram presses, as well as later designs of this type, were more nearly comparable to the 4-ram than the earlier 3-ram press.

Installed Costs of Bale Presses

The total cost of a new bale press includes the f.o.b. factory price, freight from the factory to destination, unloading, and the labor and material costs of installing the press. List prices of flat, standard density, and high density bale presses obtained from gin manufacturers in March 1958 were averaged by density types.

The cost of transportation was computed from shipping weights furnished by the manufacturers, and published freight rates of $3.28 per 100 pounds [13] on carlot shipments of ginning machinery from Texas points to the San Joaquin Valley area of California. An additional 15 cents per 100 pounds shipping weight was added to allow for unloading costs.

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[13] Freight Tariff IG, Transcontinental Freight Bureau, effective March 15, 1958, on carlot shipments of 44,000 pounds.

The labor and materials costs of installing new bale presses of each density type were computed from these costs reported by the gins for installing similar types of presses prior to 1958. These reported costs for each type of press were increased for 1958 installations by the same percentage as the f.o.b. factory price of each of these types of presses increased from the average date of installation to 1958. These percentage increases in installation costs were 76.2 for flat presses, 72.8 for standard density presses, and 22.7 for high density presses. These percentages tended to vary with the average age of presses of each density type.

The cost of new bale presses installed in the San Joaquin Valley of California in 1958 was computed to be $21,982 for flat presses, $49,113 for standard density and $67,715 for high density presses (table 6). On this basis the installed cost of a standard density press was 2-1/4 times as much as a flat press, and a high density press more than 3 times as much. In terms of the additional cost, a standard density press was more than $27,000 above that of a flat bale press and a high density press nearly $46,000 above. These additional costs of the higher density presses, as well as the ratios between the costs of the different types, are generally applicable to other areas and different price levels.

The additional investment required to replace a flat bale press in an existing plant with a higher density press depends in part on the current depreciated value, and the resale or salvage value of the press being replaced, as well as the installed cost of the new press.

Operating Expenses

Operating expenses are classified generally as fixed, variable, and bagging and ties. Fixed expenses are primarily

Table 6. - *Installed costs of model bale presses by types in the San Joaquin Valley of California, 1958*

Weight and cost items	Type of gin bale press		
	Flat density	Standard density	High density
Shipping weight including motors (pounds)	28,000	80,000	115,000
Cost of bale presses:			
Factory f.o.b. list price	$16,411	$40,009	$56,706
Freight and drayage at $3.43 per 100 pounds[1]	960	2,744	3,944
Installation-labor and materials[2]	4,611	6,360	7,065
Total installed cost	21,982	49,113	67,715

[1] Freight from Texas points to the San Joaquin Valley area of California at $3.28 and unloading at 15 cents per 100 pounds shipping weight.

[2] Installed costs reported by survey gins (appendix table 5) were increased in same ratio as f.o.b. factory price of bale presses exceeded these presses reported by survey gins.

determined by the installed cost of the bale press. Variable expenses are somewhat related to the number of bales pressed. The cost of bagging and ties is more nearly a cost of packaging than an expense of pressing of bale of cotton. However, the cost of bagging and ties is included along with fixed and variable operating expenses for the reason that the cost of bale ties is more per bale for standard and high density bales than for flat bales.

Bale press expenses, as used in this study, do not include any portion of management or other overhead expenses of operating a gin plant. Similarly, no allowance is made for any maintenance or depreciation expenses on that part of the gin building in which the bale press is housed. Total operating expenses of bale presses, as used in this study therefore, do not reflect a cost accounting viewpoint of a bale press as a functional department of a cotton gin.

Fixed Expenses

Fixed expenses include depreciation, insurance, taxes, and interest on investment (table 7). These items of expense are the same amount each year, irrespective of volume, during the useful life of a fixed asset. For this reason fixed expenses per bale vary inversely with volume. Once a bale press or any other unit of gin machinery has been installed, the only possibility of reducing annual fixed expenses per bale is to gin more cotton per season.

Depreciation. - The 1958 installed cost of model bale presses of each type were used in computing depreciation expense. Each type press was assumed to have a useful life of 20 years.[14] Salvage value at the end of 20 years was assumed to equal removal costs. The annual rate of depreciation was therefore 5 percent. The computed amounts of annual depreciation expense was $1,099 for flat presses, $2,456 for standard density presses and $3,386 for high density presses.

Depreciation expense per bale at all volume intervals was more than twice as much for standard density presses, and at least three times as much for high density, as for flat presses (table 7). These differences in depreciation expenses were a direct reflection of the differences in the installed costs of the three density type bale presses.

Depreciation expense of standard density presses at 27 cents a bale was as much as 9,000 bale volume as on flat presses at 4,000 bale volume. Similarly, depreciation on high density presses of 38 cents a bale at 9,000 bales volume was twice as much as on flat presses at 6,000 bales volume.

Insurance and Taxes. - Insurance expense of model bale presses of each density type was computed at 26.7 cents per $100 on 90 percent of the 1958 installed cost. This was the average rate reported by the gins (appendix table 7). This relatively low rate is explained by the modern, fireproof materials in buildings and machinery of most of the gins included in the field study. Insurance rates are several times higher for some other types of construction. Estimated insurance expense of model presses were $53 for flat, $118 for standard density, and $163 for high density.

Property taxes on model presses of each density type were computed at $1.42 per $100 of the 1958 installed

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[14] Internal Revenue Service, Bulletin F, Tables of Useful Lives of Depreciable Property, IRS Pub. 173, revised.

Table 7. - *Fixed expenses per bale of gin bale presses by density type and volume for model installations, 1958*

Annual volume and type of gin bale press	Depreciation	Insurance and taxes	Interest on investment	Total
4,000 bales:				
Flat	$0.27	$0.09	$0.14	$0.50
Standard density	.61	.20	.31	1.12
High density	.85	.28	.42	1.55
5,000 bales:				
Flat	.22	.07	.11	.40
Standard density	.49	.16	.25	.90
High density	.68	.22	.34	1.24
6,000 bales:				
Flat	.19	.06	.09	.34
Standard density	.41	.14	.20	.75
High density	.56	.19	.28	1.03
7,000 bales:				
Flat	.16	.05	.08	.29
Standard density	.35	.12	.17	.64
High density	.48	.16	.24	.88
8,000 bales:				
Flat	.14	.04	.07	.25
Standard density	.31	.10	.15	.56
High density	.43	.14	.21	.78
9,000 bales:				
Flat	.12	.04	.06	.22
Standard density	.27	.09	.14	.50
High density	.38	.12	.19	.69

cost -- the average rate of all the gins studied (appendix table 8). This rate is the equivalent of $5.68 per $100 on property assessed at 25 percent of cost on current value. Property taxes at these rates are several times higher than similar taxes in some other cotton-growing States. The annual amounts of tax expense on model presses were $312 for flat, $697 for standard density, and $962 for high density.

Insurance and taxes combined were not a major item of expense. These expenses for flat presses varied from 9 cents per bale at a volume of 4,000 bales down to 4 cents at 9,000 bales, for standard density presses from 20 cents to 9 cents per bale, and for high density presses, from 28 to 12 cents per bale (table 7). As for other fixed expenses, insurance and taxes at all volumes were more than twice as much for standard density, and at least three times as much for high density presses, as for flat presses.

Interest on Investment. - Although operating statements of cotton gins seldom include interest on investment as an expense, it may logically be considered as such in comparing the operating expense of bale presses of different densities. Interest on the additional capital required to buy a standard density or a high density bale press over the cost of a flat press represents an additional expense for interest irrespective of whether the capital is borrowed or furnished by the owner. In this respect, interest on investment is an alternative cost of capital.[15]

Interest on investment was computed at 5 percent on one-half of the installed cost of each type of press. Five percent was assumed to be the rate at which capital may be borrowed to finance the purchase of gin machinery, or the rate of return on capital that a prospective gin plant owner might receive if the same amount of capital were invested in securities. One-half of the installed cost of bale presses rather than the total cost was used as the invested amount since the owners recover 5 percent of the original cost each year by allowing for depreciation expense. The average investment in a bale press over its total useful life, therefore, is one-half of the original cost.

The annual expenses for interest on investment in model type bale presses were computed to be $550 for flat presses, $1,228 for standard and $1,693 for high density. Interest on investment expense for each type press, as computed, was one-half as much as for depreciation expense.

The significance of these per bale expenses for interest on investment at any volume are that they are more for each higher density type press. For example, at 4,000 bale volume, interest on the additional investment on a standard density press was 17 cents more per bale than on a flat bale press, and on a high density press, 28 cents more than on a flat press. At 8,000 bale volumes, these differences in interest expense between density type bale presses were only one-half as much as at 4,000 bales volume.

Total Fixed Expenses. - Fixed expenses per year of model type bale presses totaled $2,014 for flat presses, $4,499 for standard density, and $6,204 for high density presses. Depreciation accounted for 54.6 percent of the total, interest on investment for 27.3 percent, and insurance and taxes for 18.1 percent.

Total fixed expenses cannot be materially reduced during the useful life of a bale press once the initial investment has been made. The $2,485 additional annual fixed expenses for a standard density press, and the additional $4,190 for high density, over a flat press emphasize the importance of these figures. These additional annual amounts of fixed expense will continue throughout the useful life of these presses.

Total fixed expenses per bale, as influenced by volume and type of press, show that volume is all important with respect to fixed expenses for all presses. Fixed expenses per bale were twice as much at 4,000 bales as at 8,000 bale volume, and at 2,000 bales would be twice as much as at 4,000.

Total fixed expenses were more than $1 a bale for flat presses at volumes below 2,000 bales, for standard density presses below 4,500 bales and for high density presses below 6,000 bales. These relatively high fixed expenses per bale would likely discourage the installation of higher density presses in gins with an expected annual volume under 5,000 or 6,000 bales.

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[15] Interest on investment considered as an expense on the total amount of capital invested in a gin plant would likewise show up as non-operating interest income. Total net income or loss from all operations would, therefore, not be increased or decreased.

Variable Expenses

Variable expenses of bale presses include labor, power, repairs, and supplies. The annual amount of each of these expenses increases with the number of bales pressed but not directly. Variable expenses per bale tend to decline with volume but at a less pronounced rate than for fixed expenses. For example, fixed expenses per bale declined 50 percent between 4,000 and 8,000 bales while variable expenses declined 25 percent between these volumes.

Labor. - Average labor expense per bale for all three types of presses and at all six annual volumes was determined from the product of three factors: (1) Number of men in the press crew, (2) average wage rate per hour for bale press labor, and (3) average ginning time per bale per season at each of the six annual volumes from 4,000 to 9,000 bales.

The average number of men in bale press crews reported by the gins was

Table 8. - *Variable expenses per bale of gin bale presses by density type and volume for model installations, 1958*

Annual volume and type of gin bale press	Labor	Power	Repairs and supplies	Total
4,000 bales:				
Flat	$0.99	$0.01	$0.03	$1.03
Standard density	1.36	.05	.06	1.47
High density	1.49	.06	.12	1.67
5,000 bales:				
Flat	.92	.01	.03	.96
Standard density	1.27	.05	.06	1.38
High density	1.39	.06	.11	1.56
6,000 bales:				
Flat	.86	.01	.02	.89
Standard density	1.18	.04	.05	1.27
High density	1.29	.06	.09	1.44
7,000 bales:				
Flat	.79	.01	.02	.82
Standard density	1.09	.04	.05	1.18
High density	1.19	.05	.09	1.33
8,000 bales:				
Flat	.73	.01	.02	.76
Standard density	1.00	.04	.04	1.08
High density	1.09	.05	.08	1.22
9,000 bales:				
Flat	.66	.01	.02	.69
Standard density	.91	.04	.04	.99
High density	.99	.05	.08	1.12

two for flat presses, two full-time and one three-fourths of the time for standard density presses,[16] and three for high density presses. These average size press crews were used for model presses.

An average wage rate of $1.98 an hour, including social security taxes and labor insurance premiums paid by employers, was used for press men in all three density type presses. This was the average cost of press labor reported by seven study gins in the San Joaquin Valley of California for the 1958-59 ginning season.

Ginning time per bale of model plants, based on the ginning time of all the gins studied classified by volume (appendix table 10), was estimated to be 15 minutes for plants with 4,000 bales annual volume, with a reduction of 1 minute in average ginning time for each additional 1,000 bales volume, down to 10 minutes per bale for plants with 9,000 bale annual volume. No appreciable difference in average ginning time per bale per season was indicated by study data at the same volume between plants equipped with flat, standard, and high density bale presses within the 4,000 to 9,000 volume ranges.

At all annual volumes from 4,000 to 9,000 bales, labor expense per bale was more than a third greater for standard, and one-half more for high density than for flat presses (table 8). For all three types of presses, labor expense per bale declined only one-third as volume increased from 4,000 to 9,000 bales as compared to a reduction in fixed expenses of more than one-half at the same increase in volume. Labor expense per bale was $1 or more for standard and high density presses at all volumes below 9,000 bales.

Labor expense, not including other variable expenses, exceeded total fixed expenses at all volume intervals for all type presses except for high density of volumes below 5,000 bales. Labor expense of flat presses was twice as much as all fixed expense at 4,000 bale volume and three times as much at 9,000 bales.

The analysis of labor expenses of bale presses points up two things: (1) Labor is by far the biggest single item of expense and (2) all of the difference in labor expense between different type bale presses is explained by the number of men in the press crews.

Ginning time per bale per season varies with volume, but at any given volume is essentially the same for plants equipped with all three density type presses. Wage rates of pressmen are not necessarily influenced by the type of bale press. These conclusions suggest opportunities for reducing bale press expenses by the development of automatic or semiautomatic bale presses of all density types.

Power Expense.[17] - The electric power rate schedule in effect at the greatest number of study gins early in 1958 was used to compute power expenses of bale presses. These rates were applied to the maximum monthly kilowatt demand based on 15-minute intervals, and kilowatt hours used per bale as determined by sub-meters installed on the bale press and tramper of study gins.

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[16] One member of the bale press crew was assigned other duties for one-fourth of the time on the average for the season.

[17] A detailed explanation of methods used to estimate power expenses of bale presses as separate from the total power expenses of gin plants of which these presses were an integral part is given in appendix tables 11 to 16.

Power was a minor item of expense for each type of bale press at all volumes. The highest per bale cost of power was 6 cents for high density presses at volumes under 8,000 bales (table 8). Power expense, however, was 4 to 5 times as much for standard density as for flat presses, and for high density presses 5 to 6 times as much as for flat presses.

Power expenses per bale tended to decline with increased volume for all types of presses. For flat presses, however, power expense was so small and the decline with increased volume so gradual that all volume intervals from 4,000 to 9,000 bales showed 1 cent a bale when averages were rounded to the nearest cent. Power expense of standard density presses ranged downward from 5 cents a bale at 4,000 bales volume to 4 cents at 9,000 bales; high density presses decreased from 6 to 5 cents for the same volume.

Repairs and Supplies. - The amounts of these expenses for model presses during the 1958-59 season were estimated from those reported by study gins

Table 9. - *Total cost and expenses, cost of bagging and ties, and total operating expense per bale of bale presses by density type and volume for model installations, 1958*

Annual volume and type of gin bale press	Operating expenses: Fixed	Operating expenses: Variable	Operating expenses: Total	Bagging and ties	Total cost and expenses
4,000 bales:					
Flat	$0.50	$1.03	$1.53	$2.20	$3.73
Standard density	1.12	1.47	2.59	2.45	5.04
High density	1.55	1.67	3.22	2.45	5.67
5,000 bales:					
Flat	.40	.96	1.36	2.20	3.56
Standard density	.90	1.38	2.28	2.45	4.73
High density	1.24	1.56	2.80	2.45	5.25
6,000 bales:					
Flat	.34	.89	1.23	2.20	3.43
Standard density	.75	1.27	2.02	2.45	4.47
High density	1.03	1.44	2.47	2.45	4.92
7,000 bales:					
Flat	.29	.82	1.11	2.20	3.31
Standard density	.64	1.18	1.82	2.45	4.27
High density	.88	1.33	2.21	2.45	4.66
8,000 bales:					
Flat	.25	.76	1.01	2.20	3.21
Standard density	.56	1.08	1.64	2.45	4.09
High density	.78	1.22	2.00	2.45	4.45
9,000 bales:					
Flat	.22	.69	.91	2.20	3.11
Standard density	.50	.99	1.49	2.45	3.94
High density	.69	1.12	1.81	2.45	4.26

(appendix table 17). The amounts reported for flat presses during 1956-57 were first increased 30.5 percent, for standard density presses during 1956-57 by 36.4 percent, and for high density presses during 1957-58 by 11.4 percent. These increases were proportionate to the average annual increases in f.o.b. prices of bale presses of each type.

These adjusted amounts for reported volumes by density types were then projected to six annual volumes from 4,000 to 9,000 bales by assuming that at 7,000 bale volume one-half of these expenses was a constant amount per bale at all volumes, and the other part varied per bale with volume.

Repairs and supplies were a minor item of expense for all press types of all volume intervals from 4,000 to 9,000 bales. These expenses for volumes between 4,000 and 9,000 bales ranged downward from 3 to 2 cents a bale for flat presses, 6 to 4 cents for standard density, and 12 to 8 cents for high density presses. Although small in amount per bale, repair and supply expenses were twice as much for standard density, and three times as much for high density, as for flat presses. The annual amounts for repair and supply expenses were less than 1 percent of the installed cost for all type presses at most volume intervals.[18]

Total Variable Expenses. - Differences in variable expenses between types of presses are largely explained at all volumes by the differences in labor expenses (table 8). Labor accounted for approximately 95 percent of total variable expenses for flat presses, 91 percent for standard density, and 88 percent for high density presses at all volume intervals from 4,000 to 9,000 bales.

Bagging and Ties

The cost of bagging and ties used in the model analysis was the average cost per bale to gins in the San Joaquin Valley during the 1958-59 season. The cost of sugar bag cloth and ties averaged $2.20 a bale for flat density bales and $2.45 for standard and high density bales (table 9). The additional 25 cents a bale for standard and high density bales is accounted for by additional cost of bale ties and buckles used in higher density bales. Since the same yardage of bagging was used on all type bales, the higher density bales were more completely covered.

Total Expenses

Total expenses, including the cost of bagging and ties, varied from $5.67 a bale for high density presses at 4,000 bales volume down to $3.11 for flat presses at 9,000 bales (table 9). Total expenses per bale for any type of press at any volume, as for individual expense items, are considered less significant than the differences in per bale expenses between types of presses at the same volume.

At 4,000-bale volume, total expenses for standard density presses were $1.31 more per bale than for flat presses and $1.94 per bale more for high density presses. These differences in per bale expenses between types of bale presses decreased as volume increased. At 6,000 bale volume, for example expenses of flat presses were less than standard density presses by $1.04 per bale, and less than high density presses by $1.49.

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[18] Some engineering studies of model plants have used 1 percent of installed costs as a basis for estimating these maintenance expenses.

Total expenses of standard density presses were 35 percent more than flat presses at 4,000 bale volume and 27 percent more at 9,000 bales; high density presses were 52 percent more than flat presses at 4,000 bales and 37 percent more at 9,000 bales. These ratios would tend to remain approximately the same if any of the rates or other factors determining expenses were uniformly increased or decreased. Similarly, the inclusion of a portion of overhead expense of a gin plant as bale press expenses would not materially affect these differences. For these reasons, differences in expenses per bale between types of bale presses at each volume interval have greater significance than the total bale press expense of any type press at any volume.

A bale press of one type or another irrespective of the installed cost or expense of operation is an indispensable part of a gin plant. The basic question is, then, which type of bale press is most economical when installed costs and operating expenses are weighed against benefits realized?

Relative Importance of Bale Press Expenses

The cost of bagging and ties was more than the total of fixed and variable bale press expenses at all volumes except for standard density presses below 5,000 bales and high density presses below 7,000 bales (table 10).

As volume increased from 4,000 to 9,000 bales, the cost of bagging and ties as a percentage of total costs and expenses increased from 59 to 71 percent for flat presses, 48 to 62 for standard density, and 43 to 57 percent for high density presses. These increases in percentages resulted from the constant cost per bale for bagging and ties at all volumes while all other items of expenses per bale declined as volume increased.

Other than bagging and ties, labor was by far the largest operating expense item of model bale presses. Labor accounted for 64 to 72 percent of total fixed and variable expenses for flat presses, 52 to 61 percent for standard density presses, and 46 to 55 percent for high density presses (table 11). In all instances the lower percents were associated with the 4,000 bale volume and the higher percents with 9,000 bale volume.

Depreciation was also a major item of bale press expenses. As volume increased from 4,000 to 9,000 bales, depreciation declined from 18 to 13 percent of total fixed and variable expenses for flat bale presses, 24 to 18 percent for standard density presses, and 26 to 21 percent for high density presses. Since total depreciation expense was the same at all volumes, and the total amount of other expenses increased as volume increased, depreciation was relatively less as volume increased.

Interest on investment was the third largest item of fixed and variable expenses. As computed in this study for model presses, it was one-half as much as depreciation.

Insurance and taxes of flat presses declined from 6 to 4 percent of total fixed and variable expenses, for standard density presses from 8 to 6 percent, and for high density presses from 9 to 7 percent as volume increased from 4,000 to 9,000 bales.

Power expense was a minor item for all type presses at all volumes. It was 1 percent or less of total fixed and variable for flat presses, 2.5 percent

Table 10. - *Fixed expenses, variable expenses, and the cost of bagging and ties as a percent of total costs and expenses of bale presses, by type of press and volume, 1958-59 season*

Annual volume and type of gin bale press	Expenses		Cost of bagging and ties	Total cost and expenses
	Fixed	Variable		
		Percent		
4,000 bales:				
Flat	13.5	27.6	58.9	100
Standard density	22.3	29.2	48.5	100
High density	27.4	29.4	43.2	100
5,000 bales:				
Flat	11.3	27.0	61.7	100
Standard density	19.1	29.1	51.8	100
High density	23.6	29.7	46.7	100
6,000 bales:				
Flat	9.8	26.0	64.2	100
Standard density	16.8	28.5	54.7	100
High density	21.0	29.3	49.7	100
7,000 bales:				
Flat	8.7	24.9	66.4	100
Standard density	15.0	27.6	57.4	100
High density	19.0	28.5	52.5	100
8,000 bales:				
Flat	7.8	23.6	68.6	100
Standard density	13.7	26.4	59.9	100
High density	17.4	27.5	55.1	100
9,000 bales:				
Flat	7.2	22.1	70.7	100
Standard density	12.7	25.0	62.3	100
High density	16.2	26.3	57.5	100

or less for standard presses, and 2.8 percent or less for high density presses. Power expense, however, tended to increase in proportion to the total of fixed and variable expenses as volume increased.

Repairs and supplies for flat presses were approximately 2 percent of total fixed and operating expenses at all volumes, for standard density approximately 2.5 percent, and for high density presses about 4 percent. These expenses as a percent of total expenses increased with volume, but declined on a per bale basis.

Total variable expenses were greater than total fixed expenses at all volumes for all three types of presses (table 10). The ratio of variable over fixed expenses was lower for standard density than for flat presses and still lower for high density than for standard. Variable expenses were twice as much as fixed expenses for flat presses at 4,000 bales

Table 11. - *Fixed and variable items of expenses as a percentage of total operating expenses by type of press and volume, 1958-59 season*

Annual volume and type of gin bale press	Fixed expenses				Variable expenses				Total operating expenses
	Depreciation	Insurance and taxes	Interest on investment	Total	Labor	Power	Repairs and supplies	Total	
					Percent				
4,000 bales:									
Flat	17.9	5.9	9.0	32.8	64.5	.7	2.0	67.2	100
Standard density	23.7	7.8	11.8	43.3	52.4	1.8	2.5	56.7	100
High density	26.3	8.7	13.2	48.2	46.1	2.0	3.7	51.8	100
5,000 bales:									
Flat	16.1	5.3	8.1	29.5	67.6	.9	2.0	70.5	100
Standard density	21.5	7.2	10.8	39.5	55.8	2.2	2.5	60.5	100
High density	24.2	8.1	12.1	44.4	49.5	2.3	3.8	55.6	100
6,000 bales:									
Flat	14.9	4.9	7.5	27.3	69.8	.9	2.0	72.7	100
Standard density	20.2	6.7	10.1	37.0	58.3	2.2	2.5	63.0	100
High density	22.8	7.6	11.4	41.8	52.0	2.4	3.8	58.2	100
7,000 bales:									
Flat	14.1	4.7	7.1	25.9	71.2	.9	2.0	74.1	100
Standard density	19.3	6.4	9.6	35.3	59.8	2.3	2.6	64.7	100
High density	21.8	7.3	10.9	40.0	53.6	2.5	3.9	60.0	100
8,000 bales:									
Flat	13.7	4.5	6.8	25.0	72.0	.9	2.1	75.0	100
Standard density	18.7	6.2	9.3	34.2	60.7	2.4	2.7	65.8	100
High density	21.2	7.0	10.6	38.8	54.5	2.6	4.1	61.2	100
9,000 bales:									
Flat	13.4	4.4	6.7	24.5	72.3	1.0	2.2	75.5	100
Standard density	18.3	6.1	9.2	33.6	61.1	2.5	2.8	66.4	100
High density	20.8	6.9	10.4	38.1	54.8	2.8	4.3	61.9	100

volume, and 3 times as much at 9,000 bales; for standard density presses, 1-1/3 as much at 4,000 and twice as much at 9,000 bales volume; and for high density presses only slightly more at 4,000 bale volume and 1-2/3 more at 9,000.

Adapting Model Bale Press Expenses to Local Situation

It is recognized that the per bale expense of operating model bale presses as computed for this study may not be applicable to all cotton gins in different areas and for seasons other than 1958. The methods used, however, and much of the data may be readily adapted and adjusted for different price levels, different wage rates, varying power types and rates, and other factors.

For example, any one or all three factors of wage rate, ginning time and number of men in a press crew may be changed from the rates and amounts used and labor expenses recalculated. That is, labor expense per bale at any given volume is the product of average ginning time per bale per season, wage rate per minute, and number of men in the press crew.

Similarly, any increase or decrease in any one or more of the items which make up the installed cost of bale presses of different types, as well as any changes in rates for depreciation, interest, insurance of taxes, would result in different annual and per bale amounts for fixed expenses.

One definite advantage of the model plant method of determining costs and expenses is that adjustments and revisions may be readily made to allow for specific local situations.

Future Expansion in Use of Gin Standard and High Density Presses

Some observers believe gin extra density presses are being priced out of the picture. In 1958 computed costs of installing new gin standard and high density presses in California were about $27,000 and $46,000, respectively, above that for new flat bale presses. Others feel that gin operators able to pay $250,000 for a new gin with a flat press would not balk at increasing the total to $277,000 or even $296,000 if the added cost promised some tangible benefits. As a group, ginners have not hesitated to increase investments substantially to force or meet competition or if offsetting revenues were feasible.

In California and Arizona there have been no indications that gins installing standard or high density presses have increased volumes permanently at the expense of nearby gins with flat bale presses. In other areas, gins first installing standard or high density presses might take away some cotton from competitors but this advantage, if any, likely would be temporary. In the western cotton region, increased costs of operation of the higher density presses above those for flat presses generally have been met by extra charges passed on to marketing agencies. Obviously continuation of this arrangement depends upon whether the extra charge defrays the added costs of the ginner and is matched by comparable savings to marketing agencies along the route from gin to mill.

Gin Standard Density Press

The average tariff charge by California compresses in 1958 for compressing flat bales to standard density was $1.68 a bale, an expenditure not incurred for gin standard density bales. This sizable gross saving on the part of gin standard density bales, however, was reduced generally to a net figure of $1.01 a bale since most compresses levied a special delivery fee averaging 67 cents a bale against such bales. This net saving to marketing agencies resulted in these agencies usually paying ginners an additional $1 a bale for gin standard density bales.

According to the model plant analyses, described in detail in the section beginning on page 18 ginners in 1958 faced additional expenses in turning out standard density bales over those for flat bales, ranging from $1.31 a bale at an annual volume of 4,000 bales to 83 cents a bale at the 9,000-bale level. Even when offset by the added payment of $1 a bale from the marketing agencies, ginners turning out standard density bales would incur greater per bale operating expenses than for flat bales at all annual volumes of 6,000 bales and less on this basis. The break-even point between standard density and flat bale press operation would be about 6,500 bales. Such a large volume, however, is common among gins in the West and is not uncommon in some areas in Texas, particularly in the High Plains.

The gin standard bale has been popular in the West in spite of the very small margin between savings and additional costs. Some reasons apparently contributing to acceptance of this bale carry no tangible price labels. These include the small size, attractive appearance, and practically complete coverages of surfaces of these bales which provide small efficiencies in fire risks, handling, and storage. Another factor is the integrated nature of the cotton industry in this region. Charges or costs against these bales often go into a common purse where the gin, shipper, and compress belong to the same owner.

The chief disadvantage of gin standard density bales has been that ginners in Arizona and California did not always receive premiums for such bales when bought specifically for export shipment. In this area flat bales frequently are not compressed until final disposition is known, when either standard or high density compression is ordered according to destination of shipment. Under such conditions, shippers paying a premium for gin standard density bales and then again paying for high density compression for such bales would incur greater costs than having flat bales pressed directly to high density.

According to information developed during the course of this study, a sizable expansion in the use of gin standard density presses appears feasible from an economic standpoint in the West. Many unforeseeable factors, however, such as acreages available for cotton, cotton prices, possible new developments in press design, and the like would influence the future situation.

Outside of the West, few producing areas have many gins that consistently maintain annual volumes in excess of 6,000 bales. Also gins, shippers, and compresses generally are independent of one another. Under such circumstances, ginners normally would have to pass on extra baling costs to growers who in turn would have to recoup from marketing agencies. In any event before installing a standard density press, the ginner would have to make definite agreements with those concerned on charges. On the other hand, in some other areas gin standard density bales likely would not be at a disadvantage in the case of export since flat bales often are compressed to standard density regardless of final route of movement. In the final analysis, however, gin standard density presses are not likely to be widely adopted in most of the older areas of the Belt.

The need for reducing costs in the marketing of gin standard density bales is evident. Perhaps the field of transportation offers the most clear-cut possibility. If reduced rates were established for rail car loadings of 65,000 pounds, gin standard density bales might make such loadings popular. Cars of compress standard density cotton could be loaded to meet this figure but consistently attained it would be simpler, faster, and slightly more economical with the gin bales.

Gin High Density Press

These gin high density square bales, with 32 pounds or more per cubic foot, so far have remained largely an experimental package in this country. Under present regulations and trade rules, these bales apparently face a limited future. Currently, any high density bale, whether formed at a gin or compress, as stated previously, is ineligible for the Government price support program, is subject to rejection by domestic mills, and is untenderable on futures contracts. Such gin bales, therefore, have assured disposal only to foreign outlets.

To some extent this "little" gin bale is the victim of association. Prejudice on the part of many domestic spinners against high density cotton is predicated upon experience with compress high density cotton. The newcomer on the scene--the gin high density bale--while it can qualify in terms of density--reportedly differs considerably in performance in mill opening rooms from compress high density cotton. A compress high density bale is formed by restricting a flat or standard density bale in width. Furthermore in the process, the bale is pressed to a thickness less than that which it will finally have after tying out. This method causes the layers of cotton making up a bale to be distorted and the high pressure "kills" or compacts the cotton to the point where it fluffs up slowly after ties are removed from a bale.

In the gin bale, normal layering of cotton is maintained and no pressure exerted beyond that required to establish the thickness of the bale. Tests by several mills using various types of bales have indicated that gin high density bales performed as well on the opening room floor and in processing as did compress standard density bales which are the most common package consumed by domestic mills.

From the gin viewpoint, however, the high density press has definite cost limitations. The average charge of compresses in California in 1958-59 for high density compression was $1.81 a bale. Special delivery charges on cotton not compressed by storing plants was the same on high density gin bales as on standard density gin bales or an average of 67 cents a bale. The net difference in compress charges between having flat bales compressed to high density and shipped and shipping gin high density cotton was $1.14 a flat bale.

In 1958-59, as shown by the model analyses, the additional cost of the gin for making high density bales as compared with flat bales was $1.94 a bale at a volume of 4,000 bales and $1.15 a bale at 9,000 bales. If ginners received an added premium of $1.25 a bale for high density bales, a volume of 8,000 bales would be required before reaching a break-even point between cost of pressing high density and flat bales.

Outside of the western region in areas where flat cotton frequently is compressed to standard density and later to high density if exported, gin high density bales might command a higher premium than $1.25 a bale. Even, however, at an added premium of $1.50 a bale for high density bales, a volume of 6,000 bales would be necessary to equate expenses of operating high density and flat bale presses.

If such bales were accepted domestically, a part of their relatively high cost to ginners might be partly offset by cost advantages other than savings at the compress. Such savings likely would be particularly favorable in transportation. Car loadings of 150 bales or more of gin high density cotton could be routine and might result in some reduction in transportation costs in contrast to current minimum cost or charges based on 100-bale loadings per car.

Also the gin high density bale warrants an objective trial both here and abroad because of its attractive appearance and excellent protective qualities. Much concern is expressed about the poor reputation of American conventional bales in foreign markets. Such bales are criticized widely as being ragged in appearance and wasteful in performance. Attempts so far to improve the flat bale package have been concentrated chiefly on methods which avoid added costs or disruption of present facilities and practices. Instead, significant improvement presumably may necessitate some extra cost and some shifts in the traditional marketing pattern.

Based on the original cost of the press and operating expenses in baling high density cotton at gins, no wide-scale adoption of this neat little bale seems probable. On the other hand, it could dominate the scene in areas of concentrated production through recognition of its full potential in marketing economies and exploitation of the package as a showcase for American cotton abroad. The important barriers seem to be the current processing and marketing customs and ideas, and investments already made in flat bale gin presses and compress machinery running into the tens of millions of dollars.

Appendix

The first part of the appendix covers a description of the presses, and the second part deals with the installed costs of the presses and the operating and per bale expenses of the gins.

Description of Presses

This section is divided into two parts, one to cover gin standard density presses and the other for gin high density presses.

Gin Standard Density Presses

Of the approximately 6,800 gin batteries in operation in the United States in the 1956-57 season, about 111 or slightly less than 2 percent were equipped with standard density presses (appendix table 1). About three-fifths of these presses were at gins located in Arizona and California. Practically all were in the western region of the Belt since most of such gins in Texas were in the El Paso-Pecos area.

Appendix table 1. - *Cotton gin bale presses: Number of gin batteries by type of press and location, United States, season 1956-57*[1]

Location	Type of bale press	
	Flat	Standard density
California	208	[2]50
Texas	1,695	32
Arizona	107	18
New Mexico	59	7
Other States	4,649	4
All States	6,718	111

[1] Adapted from the report, Cotton Gin Equipment in the United States, 1957, U. S. Depart. of Agr., Agr. Mar. Serv.

[2] Includes two gin high density presses which functioned chiefly as standard density presses in 1956-57

The gin operating structure in the West provides a favorable climate for innovation. Gins there, on the average, have large capacities and annually receive relatively stable volumes of cotton far in excess of those in most other parts of the Belt. Another factor is the integrated nature of the cotton economy. Many gins are owned by, or affiliated with, large firms that engage in some related activities such as producing cotton, financing cotton growers, marketing and warehousing cotton, or both, and processing cottonseed. Elsewhere, gins frequently are an independent link in the chain of activity. In the West, this bigness facilitates large scale capital expenditures and permits consolidation of benefits from a change in practice, savings from which may be reflected in part during each of several steps in the marketing process.

Size and Volume of Gins

All gins were equipped with either 5 or 6 stands of either 80 or 90 saws per stand, the great majority having 5-90 saw stands. All were relatively modern outfits with an average age of about 5 years (appendix table 2). At flat bale gins, presses were almost entirely original equipment. Presses at the standard density gins averaged about 3 years in age or approximately 2 years less than the gins. In 1956-57, gins with each type of press received very similar volumes on the average, about 7,000 bales per gin.

Appendix table 2. - *Cotton gins: Average age of gins and bale presses and average volume of ginning by type of press, 35 selected gins in Arizona and California, season 1956-57*

Type of bale press	Gins	Average volume per gin	Average age of gin	Average age of press
	Number	*Bales*	*Years*	
Flat	18	7,068	5.0	5.2
Standard density:				
3-ram	10	6,952	4.9	3.5
4-ram	7	6,812	4.6	2.4
Total	17	6,894	4.8	3.1
All gins	35	6,984	4.9	4.2

The Bale Package

Random checks on gin weights of bales showed that flat bales averaged 498 pounds (appendix table 3). The average for standard density bales was 494 pounds. Tare also was highly similar for both types of bales, averaging a trifle less than 21 pounds per bale. Weight of bagging was about one-half pound less per standard density bale than for a flat bale but this was offset by a standard density bale carrying about one-half pound greater weight of ties.

Flat bales generally were covered with open-weave jute bagging -- each of the two strips usually measuring about 47 by 104 inches. Standard density bales were wrapped chiefly with sugar-bag cloth, the bagging averaging 52 by 100 inches per strip. Flat bales were bound with six ties, each about 11-1/2 feet in length. Standard density bales were tied-out with from 8 to 10 ties according to gin practice. Of the 17 gins, 9 used 8 ties per bale, 7 used 9 ties and 1 placed 10 ties on a bale. Ties also varied considerably in length among

Appendix table 3. - *Cotton bales: Average weight, tare, dimensions, and densities of cotton bales by type of press, 35 selected gins in Arizona and California, season 1956-57*[1]

Type of bale press	Average gross bale weight	Average bale tare: Bagging	Average bale tare: Ties and buckles	Average bale tare: Total	Average dimensions of bales[2]	Average density of bale
	Pounds				*Inches*	*Pounds per cubic foot*
Flat	498	11.6	9.1	20.7	56x28x42	13.2
Standard density:						
3-ram	492	11.1	9.8	20.9	55x21x31	24.3
4-ram	497	11.1	9.6	20.7	55x21x30	24.5

[1] Data on bale weight, dimensions, and density based on a random check of 80 bales per gin.
[2] Excluded bales from 1 gin with 3-ram press with box dimensions of 20 x 50 inches.

gins, ranging from 7-1/2 to 9-1/2 feet with the average being about 8-1/2 feet.

Among flat bales checked, densities averaged 13.2 pounds of cotton per cubic foot. Standard density bales had an average density of 24.4 pounds per cubic foot.

Although cotton bales generally expanded an inch or two in each direction after release from the box, size of bales is established in two dimensions by that of the press box. Thickness, the variable dimension, is determined principally by the distance traveled by the ram or rams in pressing the bale. Flat bales at study gins calipered 56 x 28 x 42 inches on the average and average dimensions of standard density bales were 55 x 21 x 31 inches. Standard density bales were about as tall as flat bales but were 7 inches narrower and about 10 inches thinner.

Bales routinely were pressed to approximately the same thickness regardless of weight at each gin. This practice caused bale densities to vary directly with bale weights. Average densities of flat bales ranged from about 10 pounds per cubic foot for bales weighing less than 376 pounds up to approximately 15 pounds for bales in excess of 600 pounds (appendix table 4). Densities of gin standard density bales averaged as low as about 18-1/2 pounds for bales weighing less than 376 pounds up to approximately 28 pounds for bales exceeding 600 pounds in weight.

Appendix table 4. - *Cotton bales: Relation between bale weight and density by type of gin bale press, 35 selected gins in Arizona and California, season, 1956-57*[1]

Weight interval	Flat bales		Standard density bales			
			3-ram presses		4-ram presses	
	Distribution by weight	Average density	Distribution by weight	Average density	Distribution by weight	Average density
	Percent	*Pounds per cubic foot*	*Percent*	*Pounds per cubic foot*	*Percent*	*Pounds per cubic foot*
Less than 351	-	-	0.2	17.2	-	-
351 - 375	.1	10.3	.1	17.6	0.2	18.6
376 - 400	.8	10.6	1.1	19.8	.7	20.0
401 - 425	1.9	11.2	2.5	20.3	2.3	20.9
426 - 450	6.4	11.9	8.9	21.9	7.9	22.2
451 - 475	19.6	12.4	17.5	23.1	12.9	23.0
476 - 500	29.6	13.0	28.9	24.0	29.8	24.2
501 - 525	20.8	13.7	25.8	25.4	26.8	25.4
526 - 550	10.7	14.1	9.9	26.2	13.9	26.2
551 - 575	5.3	14.6	3.5	26.8	3.2	27.6
576 - 600	2.7	15.0	1.4	27.9	.7	26.4
601 - 625	1.6	15.3	(2)	-	.7	27.3
626 and greater	.5	15.6	.2	28.5	.9	28.5
Total or average	100.0	13.2	100.0	24.3	100.0	24.5

[1] Based on records for 80 bales per gin or a total of 2,800 bales.
[2] Less than 0.05 percent.

The great majority of gin standard density bales met standard density requirements (22 pounds per cubic foot). About 88 percent of standard density bales weighed more than 450 pounds and, among this large group, bale densities ranged from 23 to 28 pounds with no significant differences between bales from 3-ram or 4-ram presses. For the small proportion of bales weighing 450 pounds or less, 4-ram presses achieved slightly higher densities than did 3-ram units.

Gin High Density Presses

During the 1957-58 season, information was collected at three gins in California with high density presses. Two of these gins had first operated in 1956-57, but had functioned chiefly as standard density presses. The other gin operated for the first time in 1957-58. All three gins were equipped with 5 stands of 90 saws each. In 1957-58, these three gins had a combined volume of 21,772 bales, of which 72 percent was pressed as high density bales and the remainder as standard density bales.

These were the only gins in the Belt in 1957-58 with presses designed to produce bales at densities comparable to compressed high density cotton. Several standard density gins, however, in both 1956-57 and 1957-58, experimentally pressed some cotton to such increased density. In 1958-59, these 3 high density gins were joined by about 12 new gins to make a total of approximately 15 high density press gins in operation.

Installed Costs of Bale Presses

Information on installation costs and operating expenses for gin bale presses was obtained from 18 flat bale gins and 17 standard density bale gins during the 1956-57 season and from 3 gins with high density presses in 1957-58. These data are summarized in the appendix tables 5 to 19. Uses made of study data as guides in estimating installed costs and computing expenses of model presses for 1958-59 operations are explained in the same order as in the text.

Gins studied reported the installed cost of bale presses by f.o.b. factory price, freight and drayage, and the cost of installation labor and materials (appendix table 5). The study data provided a basis for determining the cost of labor and materials for installing 1958

Appendix table 5. - *Average installed cost of gin bale presses as reported by Arizona and California gins, 1956-57 and 1957-58 seasons*

Type of gin bale press	F.o.b. factory price	Freight and drayage	Installation labor and materials	Total installed cost
Flat	$9,315	$680	$2,617	$12,612
Standard density:				
3-ram	19,640	1,670	3,172	24,482
4-ram	23,149	2,305	3,680	29,134
High density	46,217	2,200	5,758	54,175

Appendix table 6. - *Depreciation expenses of bale presses as related to the original cost by type of press and volume, as reported by Arizona and California gins, 1956-57 and 1957-58 seasons*

Type of bale press	Gins reporting	Annual volume	Original cost	Depreciation expense		Annual	Years of life
				Per year	Per bale		
	Number	*Bales*		*Dollars*		*Percent*	*Number*
Flat	11	6,335	13,025	1,060	.17	8.1	12.3
Standard density:							
3-ram	9	7,188	25,935	2,107	.29	8.1	12.3
4-ram	5	7,010	28,899	2,289	.33	7.9	12.7
High density	3	7,257	54,175	3,291	.45	6.1	16.4
Totals and averages	28	6,829	24,418	1,855	.27	7.6	13.2

model presses of each type (table 6). It was assumed that the cost of installation labor and materials reported by study gins for each type press increased for the 1958 model presses in the same proportions as the f.o.b. factory prices for each type press increased during the same period.

Operating Expense

All operating expense except depreciation and interest on investment for model presses of each type were adapted from data obtained from gins studied.

Depreciation Expense

The annual depreciation rates, or expected years of useful life as reported by gins studied were not uniform for all presses. They ranged from 6.1 percent for high density presses to 8.1 percent for flat presses (appendix table 6). Since these were differences among averages, variations in annual depreciation rates of individual bale presses were much wider.

Insurance and Taxes

Among the gins studied the annual amount of insurance expense was related to the insured value for each type press to determine the insurance rate per $100 insured value. Generally, insured value was 90 percent of current value.

Rates per $100 insured value varied from 19.1 cents for plant equipment with standard density 4-ram presses to 30.1 cents for plants with flat presses (appendix table 7). These differences in average rates were related to factors other than the type of bale press. In order to compute comparable insurance expense, therefore, for bale presses of each type in the model analysis, the average rate reported by all study gins of 26.7 cents per $100 insured value was applied to 90 percent of the 1958 installed costs of new presses.

As for insurance, the differences in the amount of taxes, or the rate computed on the original cost of individual plants, cannot be attributed to the type of bale presses with which these plants

Appendix table 7. - *Average fire and extended coverage insurance expense of gin plants in relation to insured value by type of press, as reported by Arizona and California gins, 1956-57 and 1957-58 seasons*

Type of bale press	Gins reporting	Insured value of gin plant[1]	Annual insurance expense	Insurance rate per $100
	Number	*Dollars*		*Cents*
Flat	12	148,244	466	30.1
Standard density:				
3-ram	4	153,452	420	27.4
4-ram	5	182,406	349	19.1
High density	3	258,889	711	27.5
Totals and averages	24	170,060	455	26.7

[1] Generally 90 percent of replacement value.

were equipped (appendix table 8). For this reason, the average rate of $1.42 per $100 original cost value on all reporting gins was applied to the 1958 installed cost of each bale press type to determine the amount of taxes applicable to each type of bale press in the model analysis.

Interest on Investment

Study gins did not, of course, report interest on investment in bale presses as an item of operating expense. This item of expense was computed, however, for presses in study gins on the basis of one-half of the reported installed value. The same rate of 5 percent per annum was used as for model presses. The expense per bale for interest on investment in bale presses of study gins is shown by type of press in appendix table 18 along with other operating expenses reported by these gins.

Appendix table 8. - *Average property tax expense in relation to original cost of gin plants by type of press, as reported by Arizona and California gins 1956-57 and 1957-58 seasons*

Type of bale press	Number of gins	Original cost of gin plant	Annual tax expense	Tax rate per $100 original cost
Flat	15	$147,377	$1,955	$1.33
Standard density:				
3-ram	6	161,399	2,318	1.44
4-ram	3	179,009	3,146	1.76
High density	1	285,000	4,000	1.40
Totals and averages	25	160,043	2,267	1.42

Appendix table 9. - *Average bale press labor expense by type of press and volume as reported by Arizona and California gins, 1956-57 and 1957-58 seasons*

Type of bale press	Gins reporting	Annual volume	Press labor used		Wage rate[1] per hour	Labor expense per bale
	Number	*Bales*	*Dollars*	*Man-hours*	*Dollars*	
Flat	17	7,188	4,809	2,774	1.73	0.67
Standard density:						
3-ram	10	6,952	5,471	3,258	1.68	.79
4-ram	7	6,812	5,753	3,276	1.76	.83
High density	3	7,258	5,170	2,964	1.74	.71
Totals and averages	37	7,059	5,196	3,015	1.72	.74

[1] Includes payroll taxes and compensation insurance.

Labor

Labor expense of bale press crews was reported by study gins in terms of total amounts paid for labor, total man-hours employed, and number of bales pressed (appendix table 9). Amounts paid for labor included Social Security taxes and premiums on workmen's compensation insurance paid by employers on these wages, which together increased total labor expense by approximately 10 percent above basic hourly rates.

Study gins also reported the basic wage rate per hour of each member of press crews. Wage rates in Arizona were approximately 40 cents an hour less for comparable jobs than in California. The weighted average rate for both states was $1.56 an hour. This hourly rate increased by 10 percent to allow for Social Security taxes and compensation insurance on these wages amounted to $1.72 an hour. Number of men in press crews by type of press was reported in table 2.

Average ginning time per bale at study gins varied from 15 minutes for gins with annual volume under 4,500 bales volume down to 9.3 minutes for

Appendix table 10. - *Average ginning time per bale as reported by Arizona and California gins by designated volume intervals, 1956-57 and 1957-58 season*

Volume intervals	Gins reporting	Annual volume ginned	Total labor used	Size of press crew	Press crew on duty	Ginning time per bale
Bales	*Number*	*Bales*	*Hours*	*Men*	*Hours*	*Minutes*
Under 4,500	1	2,491	1,868	3.00	622.7	15.0
4,500 - 5,499	6	5,088	2,019	2.17	930.4	11.0
5,500 - 6,499	9	6,117	2,834	2.31	1,226.8	12.0
6,500 - 7,499	10	7,047	3,080	2.44	1,262.3	10.7
7,500 - 8,499	2	7,938	3,053	2.49	1,226.1	9.3
8,500 and over	9	9,639	3,896	2.48	1,571.0	9.8
Totals and averages	37	7,059	3,010	2.39	1,259.4	10.7

Appendix table 11. - *Maximum monthly demand and units of electrical energy consumed per bale of gin plants including and excluding the bale press, and of the bale press alone, by type of press, as reported by Arizona and California gins, 1956-57 and 1957-58 seasons*

Type of bale press	Gins reporting	Maximum monthly demand			Energy consumed per bale		
		Gin plant including bale press	Bale press only	Gin plant excluding bale press	Gin plant including bale press	Bale press only	Gin plant excluding bale press
	Number	*Kw.*	*Kw.*	*Kw.*	*Kw.-hr.*	*Kw.-hr.*	*Kw.-hr.*
Flat	16	306.6	7.6	299.0	44.16	.38	43.78
Standard density:							
3-ram	7	296.0	20.6	275.4	40.66	1.02	39.64
4-ram	6	309.8	30.2	279.6	40.04	1.62	38.42
High density	2	389.3	36.6	352.7	46.76	2.43	44.33
Totals and averages	31	310.2	16.8	293.4	42.74	.90	41.84

plants ginning 7,500 to 8,499 bales (appendix table 10). On the basis of these data, average ginning time for model plants was assumed to vary from 15 minutes per bale at 4,000 bale volume to 10 minutes at 9,000 bales, a decline of 1 minute in average ginning time per bale with each additional 1,000 bales in annual volume.

Power Expense

In planning, the collection of field data for this study contracts were made with power companies to install submeters in survey gins on the electric motors which provided power for bale presses and trampers. These submeters were read and recorded each month by the regular power company meter readers at the time the master meter for the gin plants was read. A maximum kilowatt demand was recorded each month in addition to the number of kilowatt hours of energy consumed both for the master meter and for the submeters on press and tramper motors.

This procedure was necessary to isolate power demand, consumption, and expenses for baling operations from the totals for the gin plants. The maximum kilowatt demand for a flat bale press was about one-fifth as great as for a high density press (appendix table 11). The energy consumed in operating a flat bale press was approximately one-sixth that for the high density presses.

Appendix table 12. - *Maximum monthly demand and units of electrical energy required per bale of four model gin plants that are identical in every respect except as to the type of bale press with which equipped*

A gin plant equipped with specific type of bale press	Maximum monthly demand	Energy consumed per bale
	Kw.	*Kw.-hr.*
None (bale press removed)	293.4	41.84
Flat press	301.0	42.22
Standard density press	323.6	43.46
High density press	330.0	44.27

Appendix table 13. - *Average monthly and annual volume of survey gins 1956-57 and 1957-58 seasons and assumed volumes of model plants 1958-59 season*

Monthly periods	Average volume 24 survey gins		Annual volume of model plants 1958-59 season					
	Bales	*Percent*	*Bales*					
3rd month prior	178	2.5	100	125	150	175	200	225
2nd month prior	434	6.1	244	305	366	427	488	549
1st month prior	1,615	22.7	908	1,135	1,362	1,589	1,816	2,043
Highest month	3,665	51.5	2,060	2,575	3,090	3,605	4,120	4,635
1st month after	1,103	15.5	620	775	930	1,085	1,240	1,395
2nd month after	124	1.7	68	85	102	119	136	153
Total, season	7,166	100.0	4,000	5,000	6,000	7,000	8,000	9,000

Differences among study gins with different type bale presses as to the maximum monthly demand and the units of energy consumed per bale were due only in part to the bale presses.

Study data, however, were used as the basis for estimating the maximum demand and energy requirements of four model type gin plants that are identical in every respect except with regard to the type of bale press with which equipped (appendix table 12).

It was then assumed that each of these four plants ginned in turn six different annual volumes of 4,000 to 9,000 bales. Each of the six annual volumes were ginned by each of the four model plants over a 6-month period at the same percentage of total bales each month (appendix table 13). The number of bales ginned each month for the six different annual volumes were in the same proportion as were the 1956-57 ginnings of 24 study gins for which bales ginned by monthly periods were available (appendix table 13).

The rate schedule used to compute annual power expenses of the four model gin plants with different type bale presses at each of the six annual volumes were in effect at a majority of the study gins in California during the early part of the 1958-59 season (appendix table 14).

Next, detailed computations were made by months of the annual power expense for the four model plants, identical except for the bale press, at 4,000 bales volume (appendix table 15). Similar computations were made for other levels of volume. The maximum kilowatt demand for each of these four model plants shows up in these computations by size of the unit blocks of kilowatt hours of energy consumed.[1] These

Appendix table 14. - *Electric power rate schedule as determined by maximum kilowatt hours of energy consumed per month in effect at the greatest number of California survey gins early in 1958*

Kw.-hr. blocks of 100 times kw. demand	Rate
	Cents
First	2.54
Second	1.28
Third	1.07
All other	.86

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[1] Maximum monthly demand of each model plant, multiplied by 100, determines the size of power blocks to be priced at successive lower rates per kw.-hr. as shown by appendix table 14.

Appendix table 15. - *Power expense per month and per season of model gin plants with a seasonal volume of 4,000 bales, by type of bale press*[1]

Active months and totals	Rate per kw.-hr.	Model gin plant by type of bale press							
		No press		Flat density		Standard density		High density	
	Cents	*Kw.-hr.*	*Amount*	*Kw.-hr.*	*Amount*	*Kw.-hr.*	*Amount*	*Kw.-hr.*	*Amount*
1st month		(4,184)		(4,222)		(4,346)		(4,427)	
-	2.54	4,184	$106.27	4,222	$107.24	4,346	$110.39	4,427	$112.45
-	1.28								
-	1.07								
-	0.86								
2nd month		(10,209)		(10,302)		(10,604)		(10,802)	
-	2.54	10,209	259.31	10,302	261.67	10,604	269.34	10,802	274.37
-	1.28								
-	1.07								
-	0.86								
3rd month		(37,991)		(38,336)		(39,462)		(40,197)	
-	2.54	29,340	745.24	30,100	764.54	32,360	821.94	33,000	838.20
-	1.28	8,651	110.73	8,236	105.42	7,102	90.91	7,197	92.12
-	1.01								
-	0.86								
4th month		(86,190)		(86,973)		(89,528)		(91,196)	
-	2.54	29,340	745.24	30,100	764.54	32,360	821.94	33,000	838.20
-	1.28	29,340	375.55	30,100	385.28	32,360	414.21	33,000	422.40
-	1.07	27,510	294.36	26,773	286.47	24,808	265.45	25,196	269.60
-	0.86								
5th month		(25,941)		(26,176)		(26,945)		(27,448)	
-	2.54	25,941	658.90	26,176	664.87	26,945	684.40	27,448	697.18
-	1.28								
-	1.07								
-	0.86								
6th month		(2,845)		(2,871)		(2,955)		(3,010)	
-	2.54	2,845	72.26	2,871	72.92	2,955	75.06	3,010	76.45
-	1.28								
-	1.07								
-	0.86								
Totals-6 active months		167,360	$3,367.86	168,880	$3,412.95	173,840	$3,553.64	177,080	$3,620.97
Six dormant months		1,686	42.77	1,706	43.34	1,777	45.13	1,811	45.99
		169,046	$3,410.63	170,586	$3,456.29	175,617	$3,598.77	178,891	$3,666.96

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[1] Similar tables for other annual volumes 5,000 to 9,000 bales are not shown.

Appendix table 16. - *Kilowatt hours and cost of electric energy consumed by gin bale presses by type of press and volume, for model 1958-59 installations*

Annual volume	Flat		Standard density		High density	
Bales	*Kw.-hr.*	*Dollars*	*Kw.-hr.*	*Dollars*	*Kw.-hr.*	*Dollars*
4,000	1,542	45.66	6,573	188.14	9,847	256.33
5,000	1,930	60.14	8,221	245.59	12,311	325.88
6,000	2,312	64.72	9,850	265.15	14,755	355.24
7,000	2,695	71.26	11,485	292.13	17,204	391.92
8,000	3,077	75.68	13,113	310.92	19,647	420.16
9,000	3,459	80.04	14,742	329.67	22,091	448.32

blocks of energy were priced at the declining rates shown in appendix table 14 for these successive blocks of energy. Data in appendix table 15 for the four model plants, and similar computations for other volumes, provided a basis for determining the annual power expense of bale presses of each density type as separate from the power expense of complete gin plants including the bale press (appendix table 16).

Repairs and Supplies

Expenses for repairs and supplies of bale presses were reported as separate items by study gins (appendix table 17). Repairs were primarily parts. Supplies were largely oil for refilling hydraulic systems of presses. Methods followed in adjusting study data for use in model gin analyses were explained in the text.

Cost of Bagging and Ties

The cost of bagging and ties reported by study gins averaged $2.32 a bale for flat bales and $2.57 for standard and high density bales. These per bale amounts were for sugar-bag cloth of the same dimensions for all types of bales, with 6 ties and buckles for flat bales and 8 to 10 for standard and high

Appendix table 17. - *Average expenses of bale presses for repairs and supplies, by type of press and volume, as reported by Arizona and California gins, 1956-57 and 1957-58 seasons*

Type of bale press	Repairs		Supplies		Total	
	Bales pressed	Annual amount per press	Bales pressed	Annual amount per press	Per year per press	Per bale
	Number	*Dollars*	*Number*	*Dollars*	*Dollars*	
Flat	5,372	83	7,165	26	109	0.02
Standard density:						
3-ram	6,854	405	7,135	187	592	.08
4-ram	7,480	127	7,010	117	244	.03
High density	8,481	425	8,481	186	611	.07

Appendix table 18. - *Per bale expense of bale presses by type computed from data reported by Arizona and California study gins, 1956-57 and 1957-58*

Items	Type of gin bale press			
	Flat	Standard density		High density
		3-ram	4-ram	
Number and volume				
Number of gins	18	10	7	3
Average number of bales pressed per gin	7,040	6,970	6,840	7,183
Per bale expenses				
Fixed expense -				
Depreciation	$0.17	$0.29	$0.33	$0.45
Insurance and taxes	.03	.06	.08	.17
Interest on investment	.04	.09	.11	.19
Variable expense -				
Labor	.67	.79	.83	.71
Power	.01	.03	.04	.05
Repairs and supplies	.02	.08	.03	.07
Cost of bagging and ties	2.32	2.57	2.57	2.57
Total cost and expenses	$3.26	$3.91	$3.99	$4.21

density bales. All of the 25 cents additional per bale for standard and high density, as compared to flat bales, was accounted for by the extra ties and buckles for these higher density bales.

On the basis of supplementary estimates, the per bale cost of bagging and ties in California in 1958-59 was assumed to be $2.20 for flat bales and $2.45 for standard and high density

Appendix table 19. - *Comparative installed cost of survey and model presses and operating expense at approximately 7,000 bales volume, by type of press, reported by Arizona and California gins 1956-57 and 1957-58 seasons and computed for 1958 installations of model presses in California*

Items	Flat		Standard density		High density	
	Survey	Model	Survey	Model	Survey	Model
Installed cost of press	$12,612	$21,982	$29,134	$49,113	$54,175	$67,715
Operating expenses:						
Fixed	$0.24	$0.29	$0.52	$0.64	$0.81	$0.88
Variable	.70	.82	.90	1.18	.83	1.33
Total	0.94	1.11	1.42	1.82	1.64	2.21
Cost of bagging	2.32	2.20	2.57	2.45	2.57	2.45
Total costs and expenses	$3.26	$3.31	$3.99	$4.27	$4.21	$4.66

bales. The difference of 25 cents between flat bales and standard and high density bales was the same as reported by study gins for previous seasons.

Per Bale Expenses of Press Operation of Gins Studied

For the gins participating in the cost surveys in 1956-57 and 1957-58, total reported costs and expenses, including bagging and ties, averaged $3.26 per bale for flat presses, $3.91 and $3.99 for 3- and 4-ram standard density presses, respectively, and $4.21 for high density presses (appendix table 18). Labor accounted for over two-fifths of combined expenses exclusive of bagging and ties for high density presses and for slightly more than two-thirds at flat bale presses.

Total fixed and variable operating expenses as computed by the model approach exceeded those reported by study gins by 17 cents a bale for flat presses, 40 cents a bale for standard density presses, and 57 cents a bale for high density presses (appendix table 19). These increases in operating expenses were caused primarily by the substantial rise in capital costs of all types of presses as registered by the model plus a small increase in expenses for labor.

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